System Storage DS3000 Storage Manager Version 10

Installation and Support Guide for Microsoft Windows Server, Linux, Novell NetWare, and VMware ESX Server

System Storage DS3000 Storage Manager Version 10

Installation and Support Guide for Microsoft Windows Server, Linux, Novell NetWare, and VMware ESX Server

Note: Before using this information and the product it supports, read the general information in Appendix E, “Notices,” on page 115.

Ninth Edition (November 2008)

Contents

Figures

Tables

Chapter 1. Introduction

The IBM® System Storage™ DS3000 Storage Manager Version 10 (referred to throughout this document as *Storage Manager software*) is host software that you can use to manage your storage subsystems.

This document provides information about how to prepare, install, configure, and work with the Storage Manager software in each of the following AMD or Intel® processor-based operating systems:

- Microsoft® Windows® Server 2003 with Service Pack 2
- Microsoft Windows Server 2008
- Novell NetWare 6.5 (DS3200 and DS3400 storage subsystems only)
- Red Hat® Enterprise Linux® 5 (RHEL 5)
- Red Hat Enterprise Linux Advanced Server 4.0 (RHEL AS 4)
- SUSE Linux Enterprise Server 9 (SLES 9)
- SUSE Linux Enterprise Server 10 (SLES 10) and SUSE Linux Enterprise Server 10 Service Pack 1
- VMware ESX Server 2.5.4, VMware ESX Server 3.0.1, VMware ESX Server 3.0.2, VMware ESX Server 3.5, VMware ESX Server 3.5.1, and VMware ESX Server 3.5.2

For an interoperability matrix that lists the operating systems that are supported by the Storage Manager software, see the following Web sites:

- For the DS3200: http://www.ibm.com/systems/storage/disk/ds3000/ds3200/
- For the DS3300: http://www.ibm.com/systems/storage/disk/ds3000/ds3300/
- For the DS3400: http://www.ibm.com/systems/storage/disk/ds3000/ds3400/

Obtaining the documentation from the IBM Support Web site

If firmware and documentation updates are available, you can download them from the IBM support Web site. The Storage Manager software might have features that are not described in the documentation that comes with the unit, and the documentation might be updated occasionally to include information about those features, or technical updates might be available to provide additional information that is not included in the storage subsystem documentation. To check for updates, complete the following steps.

Note: Changes are made periodically to the IBM Web site. Procedures for locating firmware and documentation might vary slightly from what is described in this document.

1. Go to http://www.ibm.com/servers/storage/support/.
2. Under **Select your product**, in the **Product Family** field, click **Disk systems**.
3. In the **Product** field, click **DS3200**, **DS3300**, or **DS3400**, as applicable.
4. Click **Go**.
5. Make the following selections:
   - For firmware updates and readme files, under **Support & downloads**, click **Download**.
   - For documentation updates, under **Support & downloads**, click **Documentation**.

Notices in this document

The following notices are used in this document:

- **Note:** These notices provide important tips, guidance, or advice.
- **Important:** These notices provide information or advice that might help you avoid inconvenient or problem situations.
- **Attention:** These notices indicate potential damage to programs, devices, or data. An attention notice is placed just before the instruction or situation in which damage might occur.

Storage Manager software online help and diagnostics

When you are finished with the installation process, see the following online help systems:

- Enterprise Management window help

  Use this online help system to learn more about working with the entire management domain.
- Subsystem Management window help

  Use this online help system to learn more about managing individual storage subsystems.

You can access these help systems from within the Storage Manager Client. From either an Enterprise Management or Subsystem Management window, click **Help** or press F1.

Fibre Channel and iSCSI host bus adapter diagnostics

Before you use the storage subsystem, you can use a diagnostic application to make sure that the host connections are working correctly.

If you are managing Fibre Channel host bus adapters, after you install the Storage Manager software, install the QLogic SANsurfer Fibre Channel Management tool or the Emulex HBAnywhere utility. If you are managing iSCSI host bus adapters, install the QLogic SANsurfer iSCSI HBA Manager tool.

The QLogic SANsurfer program files and the Emulex HBAnywhere utility program files are available at http://www.ibm.com/servers/storage/support/disk/.

Premium features

Premium features provide enhanced functionality that enables you to perform tasks that might be limited or unavailable with your base storage subsystem model. For more information, see Chapter 10, “Enabling and using premium features,” on page 101.

You can purchase the following premium features for a DS3000 storage subsystem:

- DS3000 FlashCopy Expansion License
- DS3000 Volume Copy License
- DS3000 FlashCopy Volume Copy License
- DS3000 Partition Expansion License

FlashCopy

The FlashCopy feature supports the creation and management of FlashCopy logical drives. A FlashCopy logical drive is a logical point-in-time image of another logical drive, called a base logical drive, that is in the storage subsystem. A FlashCopy image is the logical equivalent of a complete physical copy, but you create it much more quickly and it requires less disk space.

Because a FlashCopy image is a host-addressable logical drive, you can perform backups by using the FlashCopy image while the base logical drive remains online and user-accessible. You can also write to the FlashCopy logical drive to perform application testing or scenario development and analysis. The maximum number of FlashCopy logical drives that are allowed is one-half of the total number of logical drives that are supported by your controller model.

VolumeCopy

The VolumeCopy feature is a firmware-based mechanism for replicating logical drive data within a storage array. This feature is designed as a system management tool for tasks such as relocating data to other drives for hardware upgrades or performance management, data backup, or restoring FlashCopy logical drive data.

You submit VolumeCopy requests by specifying two compatible drives. One drive is designated as the Source and the other as the Target. The VolumeCopy request is persistent so that any relevant result of the copy process can be communicated to you.

Note: The terms *VolumeCopy* and *Logical Drive Copy* are used interchangeably throughout this document, the Storage Manager Client program interface, and the online help.

Partition Expansion

You can use the Partition Expansion feature to present all of the defined logical drives in a storage subsystem to a SAN, through several different partitions. You can do this by *mapping* each logical drive to a LUN (0 - 31) in each of the defined partitions. A logical drive can be mapped to only one partition at a time. In a storage partition, the mapped logical drives are accessible only to the host server or servers whose host bus adapter host ports are defined in that storage partition. This feature enables the DS3000 storage subsystem to act as a multiple virtual storage subsystem to the host server.

Partition Expansion also enables multiple hosts that use different operating systems, with their own unique disk storage subsystem settings, to connect to the same DS3000 storage subsystem at the same time. This is known as a *heterogeneous host environment*.

Terms to know

For more information about terminology, see the online help in the Storage Manager Enterprise Management window or the Storage Subsystem Management window.

It is important to understand the distinction between the following two terms when you read this document.

Management station

A management station is a system that is used to manage a DS3000 storage subsystem. You can connect a management station to the storage subsystem by using either of the following methods:

- Through a TCP/IP Ethernet connection to the controllers in the storage subsystem (out-of-band method)
- Through a TCP/IP connection to the host-agent software that is installed on a host server, which in turn is directly attached to the storage subsystem through the input/output (I/O) path (in-band method)

For more information, see “Storage subsystem management methods” on page 8.

Host server

A host server is a server that is connected directly to a DS3000 storage subsystem through the I/O path. This server is used to perform the following tasks:

- Serve data (typically in the form of files) from the storage subsystem
- Function as a connection point to the storage subsystem for a remote-management station

Notes:

1. The terms *host* and *host server* are used interchangeably throughout this document.
2. A host server can also function as a management station.

Hardware requirements

Table 1 lists the hardware requirements for installing the Storage Manager 2 software.

Table 1. Hardware requirements for the Storage Manager 2 software

Hardware component	Requirements
Management station (for client software)	The management station computer requires the following hardware: • Intel Pentium® or Pentium-equivalent microprocessor (450 MHz or faster) • CD drive • Mouse or similar pointing device • System memory for Windows Server 2003, Linux, and NetWare: A minimum of 256 MB (512 MB preferred) • Ethernet network interface adapter • AGP or PCI video adapter (AGP preferred); ISA adapters are not supported • Monitor setting of 1024 x 768 pixels with 64 000 colors. The minimum display setting that is allowed is 800 x 600 pixels with 256 colors. • Hardware-based video acceleration. For the best performance with the Storage Manager software, do not use desktop computers that use system memory for video memory. **Important:** Some servers are not designed to run graphic-intensive software. If your server has difficulty displaying the Storage Manager user interface, you might have to upgrade the server video adapter.

For more information about host adapters, fabric switches, and managed hubs, see the following ServerProven® and interoperability Web sites:

http://www.ibm.com/servers/eserver/serverproven/compat/us/

http://www.ibm.com/systems/storage/disk/ds3000/ds3200/

http://www.ibm.com/systems/storage/disk/ds3000/ds3300/

http://www.ibm.com/systems/storage/disk/ds3000/ds3400/

Microsoft Windows software requirements

The Storage Manager software requirements and the Microsoft Windows operating system requirements are described in the following sections.

Storage Manager software requirements

Table 2 on page 6 lists the disk space and administrator privileges that are required to install the Storage Manager software in a Windows environment.

Note: The disk space that is listed in Table 2 on page 6 is for the packages after the installation. During the installation of each software package, you might need up to 150 MB of free disk space.

Table 2. Installation requirements for Windows Server 2003 and Windows Server 2008 by software package

Package	Disk space requirement for Windows Server 2003 and Windows Server 2008	Administrator privilege for Windows Server 2003 and Windows Server 2008
SMclient	130 MB	Administrator privilege is not required.
MPIO	2 MB	Administrator privilege is required.
SMagent	1 MB 50 MB (if SMclient is not installed)	Administrator privilege is required.
SMutil	2 MB	Administrator privilege is required.

Windows operating system requirements

Each management station, host server, or cluster node requires one of the following operating systems.

Important: For the latest supported operating system and host software versions, see the Storage Manager readme files and see http://www.ibm.com/servers/eserver/serverproven/compat/us/.

Management station

- Microsoft Windows Server 2003 or Windows Server 2008, Web Edition
- Microsoft Windows Server 2003 or Windows Server 2008, Standard Edition
- Microsoft Windows Server 2003 or Windows Server 2008, Enterprise Edition
- Microsoft Windows XP, Professional Edition
- Microsoft Windows Vista, Business or Enterprise Edition

Host server

- Microsoft Windows Server 2003 or Windows Server 2008, Web Edition
- Microsoft Windows Server 2003 or Windows Server 2008, Standard Edition
- Microsoft Windows Server 2003 or Windows Server 2008, Enterprise Edition

Cluster node

- Microsoft Windows Server 2003 or Windows Server 2008, Enterprise Edition

Note: For Windows Server 2003 editions, Service Pack 2 or later must be installed.

Linux software requirements

The Storage Manager software requirements and the Linux operating system requirements are described in the following sections.

Storage Manager software requirements

Table 3 lists the disk space that is required for installing the Storage Manager software in a Linux environment.

Table 3. Installation requirements for Linux by software package

Package	Disk space requirement
Storage Manager Client (SMclient)	165 MB in /opt, 2 MB in /tmp, 1 MB in /var
Linux MPP	2 MB

Table 3. Installation requirements for Linux by software package (continued)

Package	Disk space requirement
Storage Manager Agent (SMagent)	2 MB in /opt
Storage Manager Utility (SMutil)	7 MB in /opt

Linux operating system requirements

The following kernel levels are required for Linux operating systems:

- 2.6 kernel (RHEL 4, SLES 9, and SLES 10) for RDAC Revision B
- 2.6 kernel (RHEL 5 and SLES 10 SP1) for RDAC Revision C

For the latest supported Linux operating systems, details about device driver levels, and instructions for multipath configurations for Linux support, see the Storage Manager software readme files.

NetWare software requirements

The Storage Manager software requirements and the Novell NetWare operating system requirements are described in the following sections.

Note: As of the date of this document, the DS3300 storage subsystem does not support the Novell NetWare operating system.

Storage Manager software requirements

The Storage Manager software, which is required to manage a DS3000 storage subsystem, is not available for the NetWare operating system environment.

To manage a DS3000 storage subsystem that is connected to a NetWare host server, you must install the Windows or Linux version of the Storage Manager SMclient program on a management station and make an out-of-band management connection to the DS3000 storage subsystem.

Important: For details about specific device-driver levels and instructions for multipath configuration for NetWare support, see the readme file.

Table 4 lists the disk space that is required for installing the Storage Manager software in a NetWare host environment.

Table 4. Installation requirements for NetWare by software package

Package	Disk space requirement
LSIMPE.cdm driver	2 MB
Host bus adapter device driver	2 MB

NetWare operating system requirements

Each management station, host server, or cluster node requires one of the following operating systems.

Important: For the latest supported operating system and host software versions, see the Storage Manager readme files, and see http://www.ibm.com/servers/eserver/serverproven/compat/us/.

Management station

- Widows Vista
- Windows XP
- Windows Server 2003 with Service Pack 2 (SP2) or later
- Windows Server 2008
- Red Hat Enterprise Linux 4 or Red Hat Enterprise Linux 5 (RHEL 4 or RHEL 5)
- SUSE Linux Enterprise Server 9 or SUSE Linux Enterprise Server 10 (SLES 9 or SLES 10)

Host server (for I/O attachment only)
Novell NetWare 6.5 with Support Pack 6 or later

Cluster node (for I/O attachment only)
Novell NetWare 6.5 with Support Pack 6 or later

LSIMPE driver
LSIMPE.cdm

Note: Make sure that you install the correct version of the LSIMPE multipath driver. For more information, see "Installing the LSIMPE device driver and NetWare native failover device driver" on page 56.

Versions of this component are on the latest IBM host bus adapter device driver for NetWare, on Novell NetWare Support Packs, or on the Novell Web site. Always select the latest version of this component.

Note: In a Novell NetWare environment, you must manage the DS3000 storage subsystem by using the direct (out-of-band) method from a Windows or Linux management station.

Storage subsystem management methods

The Storage Manager software provides the following two methods for managing storage subsystems:

- The host-agent (in-band) management method (DS3300 and DS3400 only)
- The direct (out-of-band or Ethernet) management method

If you establish management connections from multiple management stations or hosts to the same DS3000 storage subsystem, it is best practice to have only one active management connection to the DS3000 storage subsystem at a time, even though eight simultaneous active management sessions are supported in a DS3000 storage subsystem.

Host-agent (in-band) management method (not supported for the DS3200)

When you are using the host-agent (in-band) management method, you manage the storage subsystems through the I/O path to the host. The management information can either be processed in the host or be passed to the management station through the network connection, as shown in Figure 1.

Note: As of the date of this document, the DS3200 does not support in-band management.

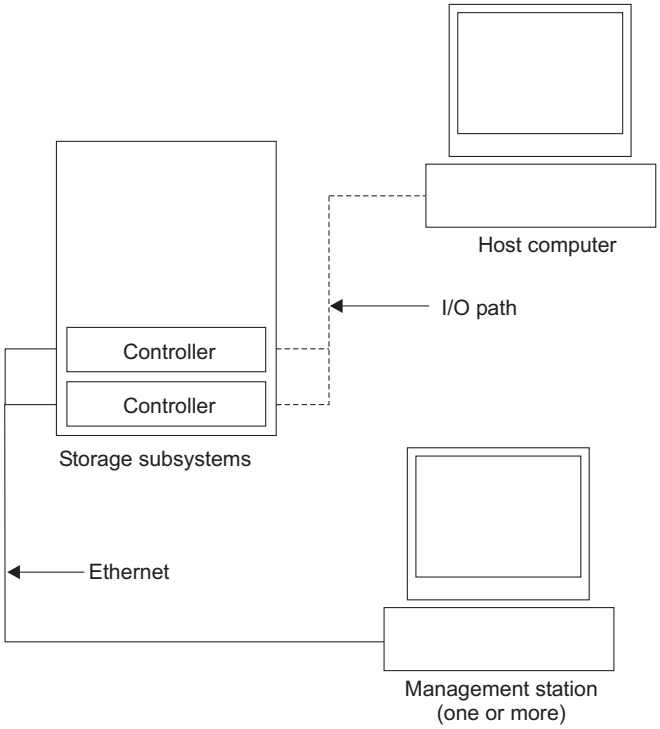

Figure 1. Host-agent (in-band) managed storage subsystems

Managing storage subsystems through the host-agent has the following advantages:

- You do not have to connect Ethernet cables to the controllers.
- You do not need a Dynamic Host Configuration Protocol/Bootstrap Protocol (DHCP/BOOTP) server to connect the storage subsystems to the network.
- You do not have to perform the controller network configuration tasks that are described in Chapter 2, “Preparing for installation,” on page 21.
- You must specify only a host name or IP address for the host instead of for the individual controllers in a storage subsystem. Storage subsystems that are attached to the host are automatically discovered, if the host-agent service is installed and running.

Managing storage subsystems through the host-agent has the following disadvantages:

- The host-agent requires a special logical drive, called an *access logical drive,* to communicate with the controllers in the storage subsystem. Therefore, you are limited to configuring one fewer logical drive than the maximum number that is allowed by the operating system and the host adapter that you are using.

- If the connection through the I/O path is lost between the host and the storage subsystem, you cannot manage or monitor the storage subsystem.

Note: The access logical drive is also referred to as the *Universal Xport Device*.

Important: If the maximum number of logical drives are configured in the host, either use the direct-management method or give up a logical drive for use as the access logical drive. For more information, see "Number of supported logical drives" on page 18.

Required host-agent (in-band) management activities

To establish host-agent (in-band) management connections, complete the following general tasks:

1. Make the I/O connections between the DS3000 storage subsystem and the host server.
2. Install TCP/IP on the host server and establish a host IP address. For instructions for host-managed systems, see "Overview of network installation tasks" on page 23.
3. Install the host bus adapter device driver, SMclient, RDAC (MPIO for Windows, Linux MPP for Linux), and SMagent on the host server.
4. Make sure that the Storage Manager Agent Service starts successfully:

   For Windows:

   a. Click **Start → Settings → Control Panel → Administrative Tools → Services**. The Services window opens.

   b. Locate the IBM System Storage DS3000 Storage Manager 2 Agent and make sure that the status is Started.

   For Linux: Type `ps -elf | grep SMagent` and make sure that the Java listening service is running.
5. Open the Storage Manager Enterprise Management window and add the IP address of the host server to the management domain. All DS3000 devices that are recognized by the host server are displayed in the Enterprise Management window.

Direct-management (out-of-band) method

When you use the direct-management (out-of-band) method, you manage storage subsystems directly over the network through a TCP/IP Ethernet connection to each controller. To manage the storage subsystem through the Ethernet connections, you must define the IP address and host name for each controller. Each of the storage subsystem controllers must be connected, through a cable that is connected to the RJ-45 connector, to an Ethernet network, as shown in Figure 2.

The following illustration shows a system in which storage subsystems are managed by using the direct-management (out-of-band) method.

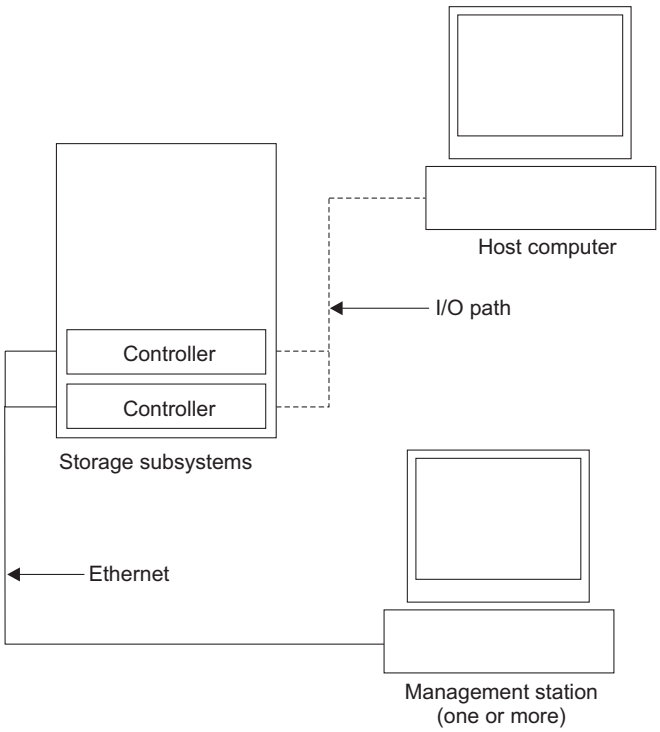

Figure 2. Direct-management (out-of-band) storage subsystems

Managing storage subsystems by using the direct-management (out-of-band) method has the following advantages:

- The Ethernet connections to the controllers enable you to manage storage subsystems that are connected to a host running any of the operating systems that Storage Manager supports through an SMclient management station.
- You do not need an access logical drive to communicate with the controllers. You can configure the maximum number of logical drives that are supported by the operating system and the host bus adapter that you are using.
- You can manage and troubleshoot the storage subsystem when there are problems with the Fibre Channel, Internet SCSI (iSCSI), or SAS links.

Managing storage subsystems by using the direct-management (out-of-band) method has the following disadvantages:

- In a dual-controller storage subsystem configuration, you need two Ethernet cables to connect the storage subsystem controllers to a network.
- When you add devices, you must specify an IP address or host name for each controller.

- Network preparation tasks are required. For a summary of the preparation tasks, see Chapter 2, “Preparing for installation,” on page 21.

Important:

- To avoid DHCP/BOOTP server and network tasks, use the controller default TCP/IP addresses or assign static IP addresses to the controller (see Table 5).
- Create a separate private network aside from the main production network for managing your DS3000 storage subsystems.

Defining controller TCP/IP addresses

The following table shows the default settings for the storage subsystem controllers.

Table 5. Default controller TCP/IP addresses

Controller	IP address	Subnet mask
A	192.168.128.101	255.255.255.0
B	192.168.128.102	255.255.255.0

To change the DS3000 storage subsystem controller default TCP/IP address, you must first make a direct-management connection to the storage subsystem by using the default TCP/IP addresses.

To change the controller default TCP/IP address by using the Storage Manager Client program, complete the following steps:

1. In the Enterprise Management window, double-click the storage subsystem for which you want to define new controller TCP/IP addresses. The Subsystem Management window opens.
2. Click the **Tools** tab.
3. On the Tools page, click **Change Network Configuration**. The Change Network Configuration window opens.

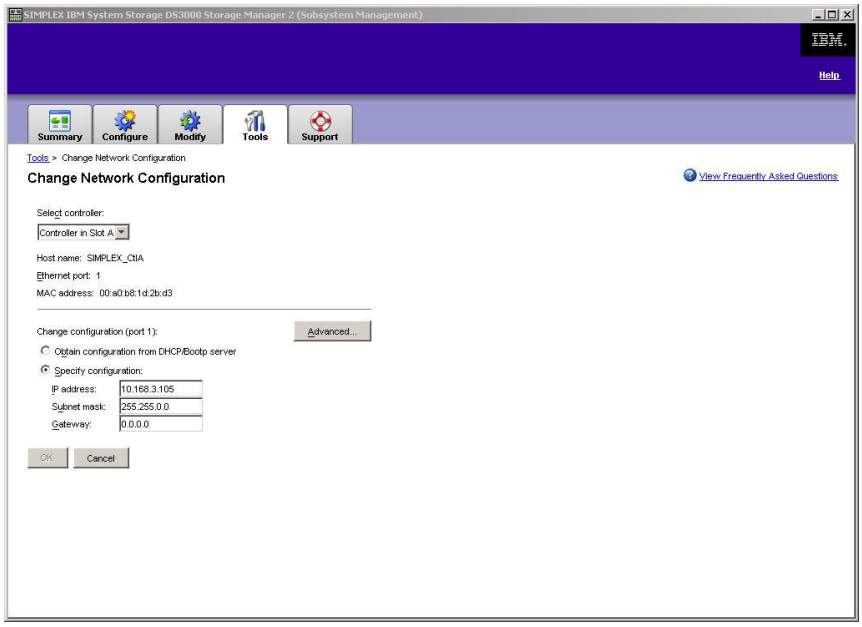

Figure 3. Change Network Configuration window

4. Select the applicable controller tab and enter the applicable TCP/IP address information for both controllers A and B.
5. Click **OK** to apply the new TCP/IP addresses.

   Important: Make sure that the new TCP/IP address information is correct because you will not be able to make a direct management connection to the storage subsystem again by using the controller default TCP/IP addresses after they are changed to different values.
6. Close the Subsystem Management window.
7. In the Enterprise Management window, delete the storage subsystem entry that contains the default TCP/IP addresses.
8. Wait approximately 5 minutes, and then re-establish the management connection to the storage subsystem by using the new TCP/IP addresses.

   Note: You might want to ping the new addresses first to make sure that there is a good network connection to the controllers before you add the storage subsystem into the Enterprise Management window.

Required direct-management (out-of-band) management activities

To establish a direct-management connection, complete the following steps:

1. Make the Ethernet connections between the DS3000 storage subsystems and the Ethernet network.
2. Follow the instructions in “Overview of network installation tasks” on page 23 for direct-managed systems.
3. Install SMclient.
4. Start the Storage Manager software and add the IP addresses for the DS3000 controllers (A and B). If you have multiple DS3000 storage subsystems, add each IP address to the domain.

Reviewing a sample network

The following illustration shows an example of a network that contains both a direct-managed storage subsystem (Network A) and a host-agent-managed storage subsystem (Network B).

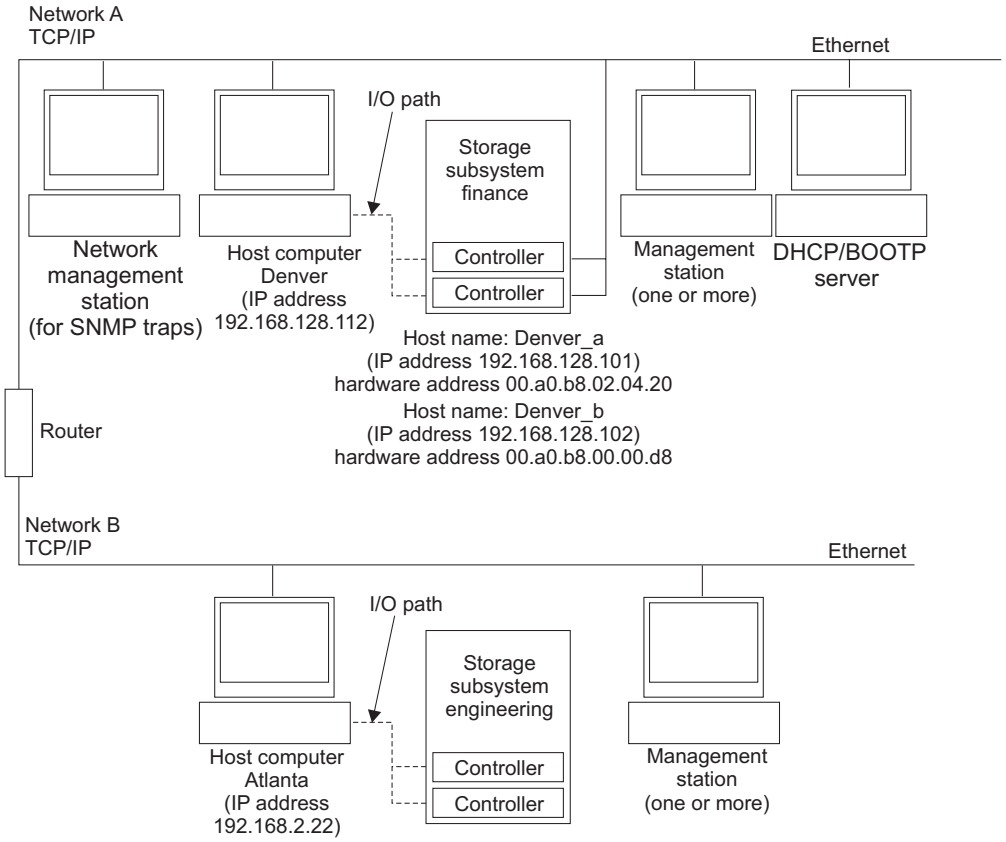

Figure 4. Sample network using direct-managed and host-agent managed storage subsystems

Direct-managed storage subsystem

In Figure 4, Network A is a direct-managed storage subsystem. Network A contains the following components:

- A DHCP/BOOTP server
- A network management station (NMS) for Simple Network Management Protocol (SNMP) traps
- A host that is connected to a storage subsystem through a Fibre Channel, iSCSI, or SAS I/O path
- A management station that is connected by an Ethernet cable to the storage subsystem controllers

Note: If you use the controller static TCP/IP addresses or default TCP/IP addresses, you do not have to setup the DHCP/BOOTP server.

Host-agent-managed storage subsystem

In Figure 4 on page 14, Network B is a host-agent-managed storage subsystem. Network B contains the following components:

- A host that is connected to a storage subsystem through a valid I/O path
- A management station that is connected by an Ethernet cable to the host server

Where to install software components

How you manage the storage subsystems determines where you must install the various software components.

Management stations

You must install the SMclient component on each management station.

Host servers

You must install the following software components on each host server.

Table 6. Required host software components

Operating system	RDAC	SMutil	LSIMPE	QLogic SANsurfer or Emulex HBAnywhere
Linux	Yes (see note 1)	Yes		Yes (see note 2)
Windows Server 2003 or Windows Server 2008	Yes (see note 4)	Yes		Yes (see note 2)
NetWare			Yes	
VMWare ESX Server	See note 3.			

Notes:

1. Linux uses Linux MPP as the multipath driver. For detailed Linux MPP installation instructions, see “Installing Linux MPP” on page 49.
2. Use Qlogic SANsurfer or Emulex HBAnywhere for IBM Fibre Channel host bus adapter management and troubleshooting problems in the Fibre Channel path between the host server host bus adapter and the DS3400 storage subsystem only.
3. As of the date of this document, the Storage Manager software is not available for VMware ESX Server operating systems. VMware has a built-in device driver for multipath operation.
4. Windows uses Storage Manager RDAC (MPIO DSM) as the multipath driver.

Depending on how you want to manage the storage subsystems, you might also have to install the following additional host software components:

- SMclient (Windows Server 2003 and Linux)
- SMagent (Windows Server 2003 and Linux [with Linux MPP only])

Notes:

1. Install the SMagent on a host server if you want to manage the DS3400 storage subsystems by using the host-agent management method.
2. You must install the SMclient on a host server if you want the host server to act as a management station. If the host server is not connected to a network, you must install TCP/IP software and assign an IP address.

Creating a SAN-attached configuration (Fibre Channel)

This section contains the following topics:

- Preparing for a SAN-attached configuration
- Steps for setting up a SAN-attached configuration
- Connecting host bus adapters in a Fibre Channel switch environment

Preparing for a SAN-attached configuration

Before you create a SAN-attached configuration, read the following information:

- Make sure that multiple host bus adapters within the same server cannot ″see″ the same DS3400 controller port.
- A multipath configuration requires two host bus adapters per host system, each in a separate switch zone that is connected to one of the two controllers.
- Each Fibre Channel host bus adapter on each host, and the controller port on each DS3000 storage subsystem, should be in its own fabric zone, if they are connecting through a single Fibre Channel switch. If multiple adapters or controller ports are in the same zone, you might encounter extended failover delays or additional failovers because device resets are being propagated throughout the zone.

Note: Single host bus adapter configurations are allowed. If you have a single host bus adapter in a SAN-attached configuration, the controller must have a Fibre Channel connection to the host bus adapter through a switch, and both controllers must be within the same SAN zone as the host bus adapter.

Attention: If a path fails in a single host bus adapter configuration, a loss of access to the data can occur.

Setting up a SAN-attached configuration

To set up a SAN-attached configuration, complete the following steps:

1. Connect the host bus adapters to the switch or switches.
2. Connect the DS3000 storage subsystems to the switch or switches.
3. Set the required zones on the Fibre Channel switch or switches, if applicable.

   Note: For information about zoning and enabling zones, see the documentation that comes with the switch.
4. Configure the system, and then verify the configuration by logging in to the switch to view the system.

For more information about setting up a DS3000 storage subsystem, see the *Quick Installation Guide* and the other documentation on the support CD that comes with the storage subsystem.

Connecting host bus adapters in a Fibre Channel switch environment

When you connect Fibre Channel host bus adapters in host servers to DS3000 storage subsystem host ports in a Fibre Channel switch environment, you should establish one-to-one zones between the host bus adapter and DS3000 host ports. If multiple adapters or controller ports are in the same zone, you might encounter extended failover delays or additional failovers because device resets are being propagated throughout the zone.

For instructions for setting up a zone inside a Fibre Channel switch, see the documentation that comes with the Fibre Channel switch.

You can find links to switch documentation at http://www.ibm.com/servers/storage/support/san/index.html.

Configuration types

You can install the Storage Manager software in either of the two following configurations:

- Standard (noncluster) configuration
- Cluster server configuration

Note: The illustrations of cluster server configurations in the following sections do not pertain to NetWare or Linux.

Standard (noncluster) configuration

Figure 5 shows a sample standard (noncluster) configuration.

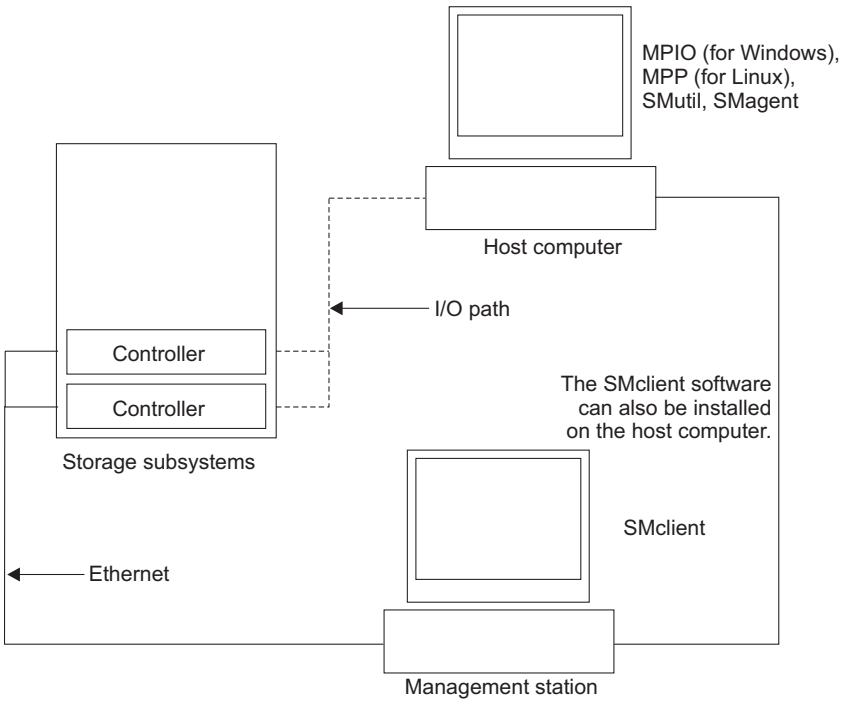

Figure 5. Sample standard (noncluster) configuration

Cluster server configuration for Windows

Figure 6 shows a sample cluster server configuration.

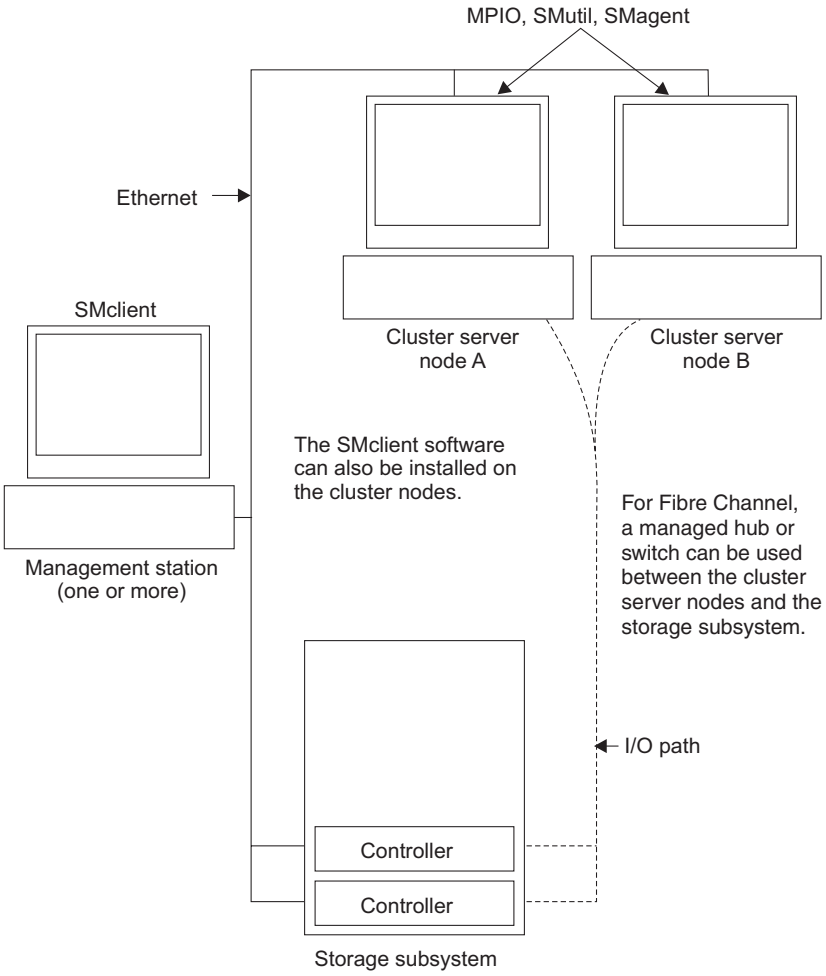

Figure 6. Sample cluster server configuration

Number of supported logical drives

The supported logical drive limits for Windows Server, Linux, and NetWare are as follows:

- Windows server supports a maximum of 255 LUNs (LUNs 0 through 254) when you use IBM host bus adapters and their supported device drivers.
- Linux supports up to 256 logical drives per storage subsystem (LUNs 0 through 255) when you use IBM host bus adapters and their supported device drivers.

  For the maximum total number of logical drives that are supported in the host server and the maximum number of logical drives that can be mapped from a storage subsystem, see your Linux kernel documentation.
- NetWare 6.5 with SP3 or later support up to 256 logical drives per storage subsystem (LUNs 0-255) when you use IBM host bus adapters and their supported device drivers.
- The maximum number of logical drives that a DS3000 storage subsystem supports is listed in Table 7 on page 19.

Table 7. Maximum number of logical drives per storage subsystem

Maximum logical drives	Maximum logical drives per storage unit partition	Maximum FlashCopy logical drives	Maximum Logical Drive Copy logical drives
256	32 (See note 1.)	128	255

Notes:

1. A maximum of four partitions is supported for base DS3000 models. To upgrade from 4 to 16 partitions, you must purchase the DS3000 Partition Expansion License.
2. Each standard logical drive supports a maximum of four FlashCopy logical drives.
3. The host-agent management method uses a special logical drive, called an *access logical drive*, to communicate with the controllers on the storage subsystem. The access logical drive uses one of the available LUNs. Therefore, managing storage subsystems with the host-agent software limits you to one fewer LUN than the maximum number that is supported by the operating system and the host adapter. The access logical drive is also referred to as the *Universal Xport Device*.

Important: The FlashCopy logical drive cannot be added or mapped to the same server that has the base logical drive of the FlashCopy logical drive in a Windows Server 2003 or NetWare environment. You must map the FlashCopy logical drive to another server.

Chapter 2. Preparing for installation

This chapter provides information to help you plan the installation of the Storage Manager software.

See the applicable sections in this document to install the Storage Manager 2 Client and host software for a particular operating system. When you have completed the Storage Manager 2 software component installation procedures, perform the procedures in Chapter 8, “Completing the Storage Manager software installation and configuration,” on page 65 and Chapter 9, “Completing storage-management tasks for Windows hosts,” on page 97.

Planning and preparing for a Windows installation

Table 8 shows the installation sequence for the Storage Manager software components and provides information to help you plan for the installation of the Storage Manager software for Windows Server 2003 or Windows Server 2008.

Table 8. Software component installation sequence in a Windows environment

System type	Software installation sequence
Management station	SMclient
Host server and cluster node	1. IBM host bus adapter device driver 2. Microsoft Windows Server 2003 Service Pack 2 (SP2) 3. Microsoft hotfix KB932755 (for Windows Server 2003 only) 4. Storage Manager host software package, which can install the following components: • SMclient (optional) SMclient is required if you manage the storage subsystem from the host server. • MPIO (required) MPIO (also referred to as MPIO DSM) is installed as the RDAC failover driver for Windows Server 2003 or Windows Server 2008. • SMagent (optional) SMagent is installed when you select the **Typical Installation** option in the Storage Manager installation wizard. It is required if you use the host-agent management method. • SMutil (required) SMutil contains the hot_add, SMdevices, and SMrepassist utilities. 5. Host bus adapter management software (Fibre Channel only)

Planning and preparing for a Linux installation

Table 9 shows the installation sequence for the Storage Manager software components and provides information to help you plan for the installation of the storage management software for Linux.

Table 9. Software component installation sequence in a Linux environment

System type	Software installation sequence
Management station (and any host server in use as a management station)	Storage Manager Client (SMclient) See "Installing the Storage Manager 2 software using the installation wizard" on page 47.
Host server and cluster node	1. IBM host bus adapter device driver (Linux version) 2. Linux MPP (required) Linux MPP is installed as the RDAC failover driver for Linux. See "The Linux MPP package" on page 48. 3. Storage Manager host software package, which can install the following components: • SMclient (optional) SMclient is required if you manage the storage subsystem from the host server. • SMagent (optional) SMagent is required if you use the host-agent (in-band) management method. You must first install Linux MPP (see step 2). The direct (out-of-band) management method is preferred in a Linux environment. See "Installing the Storage Manager 2 software using the installation wizard" on page 47. • SMutil (required) SMutil contains the hot_add, SMdevices, and SMrepassist utilities. 4. (Optional) Host bus adapter management software and QLRemote agent (QLogic SANsurfer only) Complete this step to provide Fibre Channel host bus adapter diagnostic functions. See the installation documentation that comes with the host bus adapter.

Note: Linux MPP is provided separately from the Storage Manager host software package. There are two Linux MPP packages, one for each type of kernel:

- 2.6 kernel (RHEL 4, SLES 9, and SLES 10) for RDAC Revision B
- 2.6 kernel (RHEL 5 and SLES 10 SP1) for RDAC Revision C

Planning and preparing for a NetWare installation

The Storage Manager software is not available for the NetWare operating system environment.

To manage a DS3000 storage subsystem that is connected to a NetWare host server, you must install the Windows or Linux version of the Storage Manager SMclient program on a management station and make an out-of-band management connection to the DS3000 storage subsystem.

Table 10 shows the installation sequence for the Storage Manager software components and provides information to help you plan for the installation of the storage management software.

Table 10. Software component installation sequence in a Novell NetWare 6.5 environment

System type	Software installation sequence
Management station (Windows or Linux management station only)	Storage Manager Client (SMclient)
NetWare host server and cluster node	1. Novell NetWare native failover device driver (MM.NLM) 2. LSIMPE.cdm driver 3. Host bus adapter device driver 4. (Optional) NetWare agent component of the host bus adapter management software

Overview of network installation tasks

To begin installing the storage management software, make sure that the network components are set up and operating correctly, and that you have the host and controller information that is required for the software to operate correctly.

The following sections provide an overview of the tasks that are involved in setting up a network installation for direct-managed and host-managed storage subsystems.

Direct-managed storage subsystems: Network installation overview

Setting up a network installation of a direct-managed system involves the following general tasks:

1. Install all hardware components (host servers, storage subsystems, and cables) that you want to connect to the network. For installation information, see the documentation that comes with the specific hardware device.
2. Establish a naming convention for the storage subsystems that are connected to the network. For more information, see “Step 1: Naming the storage subsystems” on page 24.
3. Record the storage subsystem names and management types in Appendix A, “Storage subsystem and controller information record,” on page 105. An example of a completed information record is shown in Table 11 on page 25.

   Note: Throughout the remaining steps, return to Appendix A, “Storage subsystem and controller information record,” on page 105 to record information such as hardware Ethernet addresses and IP addresses.
4. If you are using a default controller IP address, go to step 6 on page 24. Otherwise, obtain the TCP/IP address and host name for each of the controllers in the storage subsystems on the network from the network administrator. See “Step 3: Assigning IP addresses to hosts and controllers” on page 25.
5. Use controller static IP addresses (preferred); otherwise, set up a DHCP/BOOTP server to provide network configuration information for a specific controller.

6. Make sure that the TCP/IP software is installed. For more information, see “Step 5 (for Windows Server 2003 and Windows Server 2008): Verifying the TCP/IP protocol and setting up the host or DNS table” on page 28.
7. Power-on the devices that are connected to the network.

Host-managed systems: Network installation overview

The following steps provide an overview of the tasks that are involved in setting up a network installation of a host-managed system:

1. Install all hardware components (host servers, storage subsystems, and cables) that you want to connect to the network. For installation information, see the documentation that comes with the specific hardware device.
2. Establish a naming convention for the storage subsystems that are connected to the network. For more information, see “Step 1: Naming the storage subsystems.”
3. Record the storage subsystem names and management types in Appendix A, “Storage subsystem and controller information record,” on page 105. An example of a completed information record is shown in Table 11 on page 25.

   Note: Throughout the remaining steps, return to Appendix A, “Storage subsystem and controller information record,” on page 105 to record information such as hardware Ethernet addresses and IP addresses.
4. Obtain the IP address and host name of the host server on which the host-agent software will run from the network administrator. See “Step 3: Assigning IP addresses to hosts and controllers” on page 25.

   Note: Host-managed storage subsystems are supported with the DS3300 and DS3400 only.
5. Make sure that the TCP/IP software is installed. For more information, see “Step 5 (for Windows Server 2003 and Windows Server 2008): Verifying the TCP/IP protocol and setting up the host or DNS table” on page 28.
6. Power-on the devices that are connected to the network.

Step 1: Naming the storage subsystems

As you set up your network, decide on a naming convention for the storage subsystems. When you install the storage management software and start it for the first time, all storage subsystems in the management domain are displayed as `<unnamed>`. Use the Subsystem Management window to rename the individual storage subsystems.

Consider the following factors when you name storage subsystems:

- There is a 30-character limit. All leading and trailing spaces are deleted from the name.
- Use a unique, meaningful naming scheme that is easy to understand and remember.
- Avoid arbitrary names or names that might quickly lose their meaning.
- The software adds the prefix `Storage Subsystem` when storage-subsystem names are displayed. For example, if you name a storage subsystem Engineering, it is displayed as `Storage Subsystem Engineering`.

Step 2: Recording the storage subsystem names

After you decide on a naming scheme, record the storage subsystem names in the blank information record form in Appendix A, “Storage subsystem and controller information record,” on page 105).

Table 11 shows a sample information record for the network shown in Figure 4 on page 14. This network contains storage subsystems that are managed by using both the direct-management and host-agent-management methods.

Table 11. Sample information record

Storage subsystem name	Management method	Controllers: IP addresses and host name		Host-IP address and host name
		Controller A	**Controller B**	
Finance	Direct	IP address = 192.168.128.101	IP address = 192.168.128.102	
		Host = Denver_a	Host = Denver_b	
Engineering	Host-agent			IP address = 192.168.2.22
				Host = Atlanta

Step 3: Assigning IP addresses to hosts and controllers

If you plan to manage your storage subsystem by using the out-of-band management (direct-management) method, assign a unique IP address for every controller in all storage subsystems on the network. Record the IP address for each controller in the information record (Appendix A, “Storage subsystem and controller information record,” on page 105). Then, go to “Step 4: Setting up a Windows Server 2003 or Windows Server 2008 DHCP or BOOTP-compatible server” on page 26.

Note: To avoid performing DHCP/BOOTP server and network tasks, use the controller default TCP/IP addresses or assign static IP addresses to the controllers. If you are not able to use the controller default TCP/IP address to assign the static TCP/IP address, see the information in “Direct-management (out-of-band) method” on page 11.

Then, go to “Step 5 (for Windows Server 2003 and Windows Server 2008): Verifying the TCP/IP protocol and setting up the host or DNS table” on page 28.

You can establish the out-of-band management connection to the DS3000 storage subsystem by using the default IP addresses of 192.168.128.101 for controller A and 192.168.128.102 for controller B. You can change the IP addresses by using the Storage Manager Client Subsystem Management window.

For host-agent management only: If you plan to manage the DS3300 or DS3400 storage subsystem by using the host-agent management method, assign an IP address for each host on which you will install the host-agent software. Record the IP address for each host in the information record in Appendix A, “Storage subsystem and controller information record,” on page 105; then, go to “Step 5 (for Windows Server 2003 and Windows Server 2008): Verifying the TCP/IP protocol and setting up the host or DNS table” on page 28.

Step 4: Setting up a Windows Server 2003 or Windows Server 2008 DHCP or BOOTP-compatible server

To manage storage subsystems directly through the Ethernet connection to each controller, you can set up a DHCP or BOOTP-compatible server and configure the following options:

- Router/gateway
- DNS server
- Host name
- DNS

This section provides instructions for setting up a DHCP server on Windows Server 2003 or Windows Server 2008.

You must use a version of DHCP that supports BOOTP static addressing. To use a DHCP server, a DHCP Manager must be installed. If a DHCP Manager is already installed in the system, see "Creating a scope and setting up a DHCP server on Windows Server 2003" on page 27.

Installing the DHCP Manager for Windows Server 2003

To install the DHCP Manager, complete the following steps:

1. Click **Start → Control Panel → Add or Remove Programs**. The Add or Remove Programs window opens.
2. In the left pane, click **Add/Remove Windows Components**. The Windows Components Wizard window opens.
3. In the **Components** field, select **Networking Services**. Then click **Details**. The Networking Services window opens.

   Note: Do not select the check box; you do not want to install all of the Networking Services subcomponents.
4. In the **Subcomponents of Networking Services** field, select **Dynamic Host Configuration Protocol (DHCP)**. Click **OK**.
5. In the Windows Components Wizard window, click **Next** to start the installation process.
6. If you are prompted, type the full path to the Windows Server 2003 distribution files and click **Continue**.
7. After the installation has been completed successfully and the Windows Components Wizard window opens, click **Finish**.
8. Close the Add or Remove Programs window. You are now ready to perform the tasks in "Creating a scope and setting up a DHCP server on Windows Server 2003" on page 27.

After you install the DHCP Manager, see the DHCP Manager online help for more information.

Creating a scope and setting up a DHCP server on Windows Server 2003

A scope defines a group of controllers by their IP addresses. You must create and configure a scope so that dynamic IP addresses can be assigned to controllers on the network. See Appendix A, “Storage subsystem and controller information record,” on page 105. Before you begin, read the instructions to determine what information is required. Then request the information from your network administrator.

To create a scope and to set up a DHCP server, complete the following steps:

1. Click **Start → Administrative Tools → DHCP**. The DHCP window opens.
2. In the Console tree, right-click the server that you want to configure, and then click **New Scope**. The New Scope Wizard starts.
3. Follow the on-screen instructions to define the scope of IP addresses for TCP/IP clients. You will define the following fields:
   - Scope name and description
   - IP address range and the subnet mask for the controllers that you are configuring
   - IP addresses that you want to exclude from the IP address range
   - IP address lease duration
   - Common DHCP options:
     - IP address for a router
     - Domain name and DNS servers or Windows Internet Naming Service (WINS) servers
4. When you have defined the scope, click **Yes, I want to activate this scope now**. The New Scope Wizard window opens.
5. Click **Finish**. The DHCP window opens.
6. In the Console tree, expand the Scope folder.
7. Right-click **Reservations**. Then select **New Reservations**. The New Reservations window opens.
8. To define the IP address reservation, type the following information:
   - Reservation name
   - IP address
   - Ethernet hardware MAC address
   - Description
9. In the **Supported Type** field, select **Both (DHCP and BOOTP)**.
10. Click **Add**.
11. Repeat steps 7 through 10 for each controller in the network.
12. Restart the DHCP server and then restart the storage subsystem so that all the modifications are applied.
13. Go to “Step 5 (for Windows Server 2003 and Windows Server 2008): Verifying the TCP/IP protocol and setting up the host or DNS table” on page 28.

Installing a DHCP server and creating a scope for Windows Server 2008

To install and configure the DHCP Manager, complete the following steps:

1. Click **Start → Control Panel**. The Control Panel window opens.
2. Click **Turn Windows features on or off**. The Server Manager window opens.
3. In the **Roles Summary** section, select **Add Roles**. The Add Roles Wizard window opens. Click **Next**.
4. In the **Select Server Roles** section, select **DHCP (Dynamic Host Configuration Protocol) Server** and click **Next**.
5. The Introduction to DHCP Server window opens. After reviewing the information, click **Next**.
6. The Specify the IPv4 DNS Server Settings window opens. Specify the Parent Domain, a preferred DNS Server IPv4 Address (if needed), and an Alternate DNS Server IPv4 Address. Then, click **Next**.
7. The Specify IPv4 WINS Server Settings window opens. Provide the WINS information (if needed), then click **Next**.
8. The DHCP Scopes window opens. Select **Add** to add a new DHCP scope. The Add Scope window opens and the following information must be defined:
   Scope Name
   Starting IP Address
   Ending IP Address
   Subnet Mask
   Default Gateway (optional)
   Subnet type

   After you have defined the information, click **OK**, and then click **Next**.
9. The Configure DHCPv6 Stateless Mode window opens. Click **Enable** to enable DHCPv6 and then configure the IPv6 DNS settings. Click **Disable** to disable the DHCPv6 stateless mode for this server. Click **Next**.
10. The DHCP Server Selection Confirmation window opens. Review the information and click **Next** to start the installation process.
11. After the installation is completed, click **Close**.

Step 5 (for Windows Server 2003 and Windows Server 2008): Verifying the TCP/IP protocol and setting up the host or DNS table

To enable SMclient functions, you must install the TCP/IP networking stack, which requires that you perform the following two tasks:

- Make sure that the TCP/IP protocol software is installed on the management station or the host server on which you will install SMclient and from which you will run SMclient.
- Set up the host or DNS table.

Note: Make sure that the host names for the controllers match the IP addresses for the controllers.

To make sure that the TCP/IP protocol software is installed and to set up the host or DNS table, complete the following steps:

1. Open the Windows Explorer window.
2. Right-click the My Network Places folder and select **Properties**. The Network Connections window opens.
3. Right-click a defined network connection and select **Properties**.
4. In the *network_name* Properties window that opens, in **The Connection Uses The Following Items** area, select the **Internet Protocol TCP/IP** check box (if it is not already selected) and click **OK**.
5. Update the DNS table to specify a host name to associate with an IP address. If you do not have a DNS server, use a text editor to update the hosts file to link the IP address and controller name entries. The following example shows the host tables for the controllers that are connected to Network A, as shown in Figure 4 on page 14.
6. Attempt to ping one of the controller devices that are listed in the c:/windows/system32/drivers/etc/hosts file. In the following example, this is performed by typing `ping denver_a` from an MS-DOS command prompt.

```
# Copyright (c) 1993-1999 Microsoft Corp.

# This is a sample HOSTS file used by Microsoft TCP/IP for Windows.

# This file contains the mappings of IP addresses to host names. Each
# entry should be kept on an individual line. The IP address should
# be placed in the first column followed by the corresponding host name.
# The IP address and the host name should be separated by at least one
# space.

# Additionally, comments (such as these) may be inserted on individual

# lines or following the machine name denoted by a '#' symbol.

# For example:

#      102.54.94.97     rhino.acme.com          # source server

#       38.25.63.10     x.acme.com              # x client host

127.0.0.1       localhost

192.168.128.101 denver_a

192.168.128.102 denver_b
```

Step 5 (for Linux): Verifying the TCP/IP protocol and setting up the host or DNS table

The default installation process installs the TCP/IP software package. To make sure that TCP/IP software package was installed successfully, open a shell prompt and type `ifconfig`. If you see an eth0 or eth1 interface, the IP protocol is enabled.

To set up the host or DNS table, complete the following steps. Make sure that the host names for the controller match the IP addresses for the controllers.

1. Update either the host table or the DNS table to specify a host name to associate with an IP address. If you do not have a DNS table, edit the host table that is in the /etc/hosts file. Your directory might be different if the operating system is not installed on the root.
2. To manage storage subsystems through a firewall, configure the firewall to open port 2463 to TCP data.
3. Attempt to ping one of the controllers that are listed in the /etc/hosts file.

The following example shows a Linux host file.

```
# Do not remove the following line, or various programs
# that require network functionality will fail.

127.0.0.1 rh71_8500 localhost.localdomain
102.54.94.97 rhino.acme.com x.acme.com
```

Chapter 3. Installing the Storage Manager software in a standard Windows configuration

Note: If you are configuring the system for clustering, see Chapter 4, “Installing the Storage Manager software in a Windows cluster server environment,” on page 39.

This chapter describes how to install the Storage Manager software for Windows Server in a standard (noncluster) configuration.

Before you install the software, read the following information:

- For correct installation, make sure that you have completed all preparation tasks that are described in Chapter 2, “Preparing for installation,” on page 21.
- Always check for a readme file on any installation media. The readme file contains important information that was not available when this document was prepared.
- This version of the Storage Manager software does not support 64-bit versions of Windows XP. All administrator functions that use the Storage Manager software must be performed from a 32-bit management station.
- Configure the event monitor on only one management station to prevent the receipt of duplicate event messages. Note that duplicate alerts are also sent if the Enterprise Management window and the SMmonitor are running simultaneously.
- Do not restart the system during the installation process. You will restart the system after you install all Storage Manager software components.

New installation process

You can install the Storage Manager software components either on host servers only or on both host servers and management stations.

Management station: A management station is a system that you use to manage the storage subsystem. You can attach it to the storage subsystem in either of the following ways:

- Through a TCP/IP Ethernet connection to the controllers in the storage subsystem
- Through a TCP/IP network connection to a host server with host-agent software installed on it, which in turn is directly attached to the storage subsystem through the I/O path

You *must* install the Storage Manager SMclient software on a management station.

Host server: A host server (or host) is a server that is connected directly to the storage subsystem through an I/O path.

Important: Make sure that you install the host bus adapter and device driver before you install the Storage Manager software.

To begin the installation on the management station, see “Installing the Storage Manager host software packages” on page 34.

To begin the installation on a host, see “Installing the Storport miniport host bus adapter device driver.”

Installing the Storport miniport host bus adapter device driver

An IBM Fibre Channel, iSCSI, or SAS host bus adapter provides the interface between a host server and a DS3000 storage subsystem. IBM Fibre Channel, iSCSI, and SAS host bus adapters are high-performance, direct memory access, bus-master host adapters that are designed for high-end systems. The Fibre Channel host bus adapters support all Fibre Channel peripheral devices that support private-loop, direct-attach, and fabric-loop attachment. The IBM host bus adapter device driver enables the operating system to communicate with the host bus adapter.

The Storage Manager software provides the multi-path support for a Fibre Channel, iSCSI, or SAS host bus adapter device driver based on the Microsoft Storport miniport device-driver model. The Storport miniport device-driver model was introduced in the Microsoft Windows Server 2003 release as a replacement for the SCSIport miniport device driver model. It is the only supported device driver model for Windows Server 2003 x64 editions, which support the AMD64 and EM64T servers.

To support Storport miniport device drivers, Service Pack 2 and the latest Storport miniport hotfix must be installed in the Windows Server 2003 operating system. You can download the latest Storport hotfix from http://www.support.microsoft.com/kb/932755/en-us/. See the Storage Manager readme file for Microsoft Windows operating systems for other requirements, such as controller firmware versions or other Microsoft updates, and for information about the latest versions of the hotfix.

Storage Manager software for Windows Server 2003 and Windows Server 2008

The Storage Manager software package contains the following components for Microsoft Windows Server 2003 and Windows Server 2008:

- Storage Manager Agent (SMagent)
- Storage Manager Utility (SMutil)
- Storage Manager Client (SMclient)
- Storage Manager redundant disk array controller (RDAC)

  Note: The Storage Manager RDAC installs the multipath I/O (MPIO) Device Specific Module (DSM) multipath driver for Windows. The Storage Manager RDAC is different from the Linux multipath proxy (MPP) multipath driver.

Install the Storage Manager Client (SMclient) on the management station. Installing the SMclient on a host management station is optional.

Install the following components only on the host:

- Storage Manager RDAC (MPIO)
- Storage Manager Agent (SMagent)
- Storage Manager Utility (SMutil)

Storage Manager Client

The Storage Manager Client (SMclient) component provides the graphical user interface (GUI) for managing storage subsystems. The SMclient contains two main components:

- **Enterprise Management**. Use the Enterprise Management component to add, remove, and monitor storage subsystems within the management domain.
- **Subsystem Management**. Use the Subsystem Management component to manage the components of an individual storage subsystem.

The Event Monitor is a separate program that is bundled with the SMclient. If the Event Monitor is installed, it monitors storage subsystems whenever the Enterprise Management window is closed. It runs continuously in the background and can send alert notifications in the event of a critical problem.

Note: You must enable the Event Monitor if you want to use automatic ESM firmware synchronization.

When you install a new ESM into an existing EXP3000 that is attached to a DS3000 storage subsystem that supports automatic ESM firmware synchronization, this feature resolves firmware mismatch conditions by automatically synchronizing the firmware in the new ESM with the firmware in the existing ESM.

Note: The Event Monitor can perform ESM firmware synchronization only if the .esm file is in the c:\program files\ibm_ds3000\client\data\firmware\esm\ directory. Each time a new ESM firmware download is performed from the Storage Manager software, the .esm file is automatically added to this directory.

Storage Manager RDAC (MPIO)

The Storage Manager RDAC (MPIO) contains the multipath driver that is required for controller failover support when a component on the host I/O path fails.

Storage Manager Agent

The Storage Manager Agent (SMagent) provides a management conduit for the SMclient to configure and monitor the DS3300 and DS3400 storage subsystem through the I/O path. The agent also provides local or remote access to the SMclient, depending on whether the SMclient is installed on the host or on a network management station over the TCP/IP network.

Note: As of the date of this document, the DS3200 does not support in-band management.

Storage Manager Utility

The Storage Manager Utility suite enables you to discover newly mapped logical drives and to list the currently mapped logical drives for the host. This software package contains the following components:

- **hot_add utility**

  Use the hot_add utility to register newly created logical drives with the operating system. For more information, see the online help.

- **SMdevices utility**

  Use the SMdevices utility to associate storage subsystem logical drives with operating-system device names. For more information, see “Using the SMdevices utility” on page 98.
- **SMrepassist utility**

  Use the SMrepassist utility to flush cached data before you create a FlashCopy or VolumeCopy image. For more information, see “Using the SMrepassist utility” on page 99.

  Note: The SMrepassist utility is a Windows-only utility. Unmount the file system if you are using a non-Windows operating system.

Installing the Storage Manager host software packages

This section describes how to install different components of Storage Manager host software on management stations and host servers that run Windows operating systems.

Before you install the software, make sure that the management station or host server has at least 220 MB of available disk space for the installation software package, the temporary files during installation, and the final files after the installation.

Important: When you install SMclient on a stand-alone host and manage storage subsystems through the I/O path and not through the network, you must install the TCP/IP software on the host and assign an IP address to the host.

All four components of the Storage Manager host software, SMclient, Storage Manager RDAC (MPIO), SMagent, and SMutil, are packaged in a single host software package installer. You can install up to four packages by using this host software package installation program.

Note: The Microsoft Windows XP and Windows Vista operating systems support the Storage Manager Client package only. Do *not* install any other Storage Manager software packages on Windows XP or Windows Vista. MPIO is *not* supported on Windows XP or Windows Vista.

To install the Storage Manager host software packages on either a host server or management station, complete the following steps.

Important: These installation instructions are not for host servers with SAN-boot or Remote-boot disk. SAN-boot and Remote-boot disk are supported only by DS3300 and DS3400 storage subsystems.

1. Before you install this software, close all other programs.
2. Insert the *IBM System Storage DS3000 Support* CD into the CD drive.

   Note: If you downloaded the Storage Manager host software package for Windows from the DS3000 support Web site, you must extract the files from the downloaded .zip file into a specific directory. Go to this directory and select the Windows directory to get access to the Windows host software package installation program. Go to step 6 on page 35.

3. From the Windows desktop, double-click the **My Computer** icon. The My Computer window opens.
4. Double-click the CD drive that contains the *Support* CD. The CD window opens.
5. Select the applicable directory on the CD for your operating system architecture.

Directory	Operating System
Windows_x86_32bit	Windows Server 2003 x86 32-bit edition (IA32) Server, Enterprise Edition and DataCenter Windows Server 2008 x86 32-bit edition (IA32) Server, Enterprise Edition and DataCenter
Windows_x64_64bit	Windows Server 2003 x64 64-bit edition (AMD64 and EM64T) Server, Enterprise Edition and DataCenter Windows Server 2008 x64 64-bit edition (AMD64 and EM64T) Server, Enterprise Edition and DataCenter

6. To start the host software package installer, double-click the executable (.exe) file, such as SMIA-WSxxx.exe.

   The InstallAnywhere Installation wizard window opens while the software is loading. Follow the instructions in each window of the wizard.
7. When the Select Installation Type window opens, you can select one of the following options (see Figure 7 on page 36):
   - **Typical (Full Installation):** This default selection installs all of the packages on the system. This is a safe choice if you do not know which installation type to select. This option installs all four host software components: SMclient, MPIO, SMagent, and SMutil. This is the default selection for a host running a supported server operating system such as Microsoft Windows Server, SUSE Linux Enterprise Server, or Red Hat Enterprise Linux.
   - **Management Station:** This selection installs the software that is required to configure, manage, and monitor a storage subsystem. This option is for the workstation or management computer. This option installs the SMclient program only. This is the default selection for a host running a supported client operating system such as Microsoft Windows XP or Windows Vista.
   - **Host:** This selection installs the storage subsystem server software. Use this type of installation for the host (server) that is connected to the storage subsystem (Windows Server 2003 and Windows Server 2008 only). This option installs all host software components except the SMclient program.
   - **Custom:** This selection enables you to customize the features that are to be installed.

     Important: You must install the MPIO package before you can install and use the Storage Manager Agent.

Figure 7. Select Installation Type window

8. Click **Next**.

   If there are previously installed Storage Manager software packages, the Overwrite Warning window opens.

9. If the Overwrite Warning window opens, click **OK**.

   The Automatically Start Monitor window opens. This is the event monitor service that will monitor the specified DS3000 storage subsystems and forward any critical alerts from those subsystems when the SMclient program is not running.

10. On the Automatically Start Monitor window, select the applicable option for your system.

    Notes:

    a. To enable automatic ESM firmware synchronization, you must enable the Event Monitor. Select **Automatically Start Monitor**. For more information, see “Automatic ESM firmware synchronization” on page 86.

    b. If you start the Event Monitor Service on multiple systems, you might receive duplicate error messages from the same storage array. To avoid receiving duplicate error messages, start the Event Monitor on only one system that will run continuously.

11. Click **Next**.

    The Pre-Installation Summary window opens.

12. Click **Install**.

The Installing IBM DS3000 Storage Manager window opens while the software is being installed. The Installation/Remove status window might also open throughout the installation process. After the software is installed, the Install Complete window opens.

Important:

If you cancel an installation before the installation is completed (while the progress bar is still visible), the installation might not clean up the canceled installation correctly, and the host-software installation wizard creates an installation log. Also, the Add/Remove Program window might show that the program is already installed. However, when you try to uninstall it, an uninstallation error is displayed, and you are asked whether you want to remove the entry from the Add/Remove program list. Click **Yes** to remove the entry. Then, you must delete the .xml file from one of the following directories:

- **For Windows Server 2003 32-bit edition or Windows Server 2008 32-bit edition:**
  Windows_boot_drive_letter:\Program Files\Zero G Registry
- **For Windows Server 2003 64-bit edition:**
  Windows_boot_drive_letter:\Program Files (x86)\Zero G Registry

The Windows_boot_drive_letter:\Program Files\Zero G Registry directory might be hidden from the normal Windows Explorer view. If this is the case, change the settings of the Windows Explorer to **Show hidden files and folders**.

If you cancel the installation *before* the progress bar is visible, the installation wizard cleans up the canceled process correctly. You do not have to do anything before you start the wizard again.

13. Make sure that the **Yes, restart my system** option is selected.
14. Click **Done**.

    Several files and program packages are installed to the directory that you specified previously in the procedure. The default directories are as follows:

    - **For Windows Server 2003 32-bit edition or Windows Server 2008 32-bit edition:**
      Windows_boot_drive_letter:\Program Files\IBM_DS3000
    - **For Windows Server 2003 64-bit edition:**
      Windows_boot_drive_letter:\Program Files (x86)\IBM_DS3000

    The installation is completed, and Windows is restarted.

    Important: If you repeatedly cancel an installation or uninstallation before the process is completed and you try to install the software again, the installation process might not work, and the software might not be installed after the installation process is completed. The Install Complete window indicates where the software is installed, but the software is not there. If this problem occurs, delete the .xml file from the applicable default directory that is listed in step 12 on page 36.

To make sure that the software packages were installed, go to “Verifying the installation” on page 38.

Verifying the installation

To make sure that the host-software package installer ran successfully, complete the following steps:

1. Select **Start → Settings → Control Panel**.

   The Control Panel window opens. Select **Add/Remove programs**. The Add/Remove Programs Properties window opens.
2. Find the IBM DS3000 Storage Manager Host Software entry. The entry has the applicable version number, for example, 02.17.x5.00.
3. If the installation was successful (no failure reported), go to Chapter 8, “Completing the Storage Manager software installation and configuration,” on page 65. Otherwise, repeat the steps in “Installing the Storage Manager host software packages” on page 34. If the failure remains, contact your technical-support representative.

For information about uninstalling the Storage Manager software components in Windows, see “Uninstalling storage management software components” on page 100.

Configuring storage management

After you install the Storage Manager software, complete the following tasks that are described in Chapter 8, “Completing the Storage Manager software installation and configuration,” on page 65.

- Performing an initial automatic discovery of storage subsystems
- Adding storage subsystems
- Naming storage subsystems
- Configuring alerts
- Configuring host access
- Defining host groups
- Creating arrays and logical drives
- Managing iSCSI settings (DS3300 only)
- Downloading controller firmware and NVSRAM

Chapter 4. Installing the Storage Manager software in a Windows cluster server environment

This chapter describes how to install the Storage Manager software in a Windows cluster server environment. Before you install the software, complete all the preparation tasks that are described in Chapter 2, “Preparing for installation,” on page 21.

Important: Always check the Storage Manager software readme file for your operating system before you install the software. A readme file contains important information that was not available when this document was prepared.

Preinstallation considerations

The hardware installation involves installing host bus adapters and storage subsystems. Before you begin the installation of the DS3000 Storage Manager software, make sure that all hardware components are installed correctly for the cluster server configuration.

Configuration options

You can connect the storage subsystem to the cluster nodes either directly or through switches (for iSCSI and Fibre Channel host bus adapters only). Figure 8 on page 40 shows typical direct-attached or Fibre Channel switch connection configurations. Both configurations provide full redundancy.

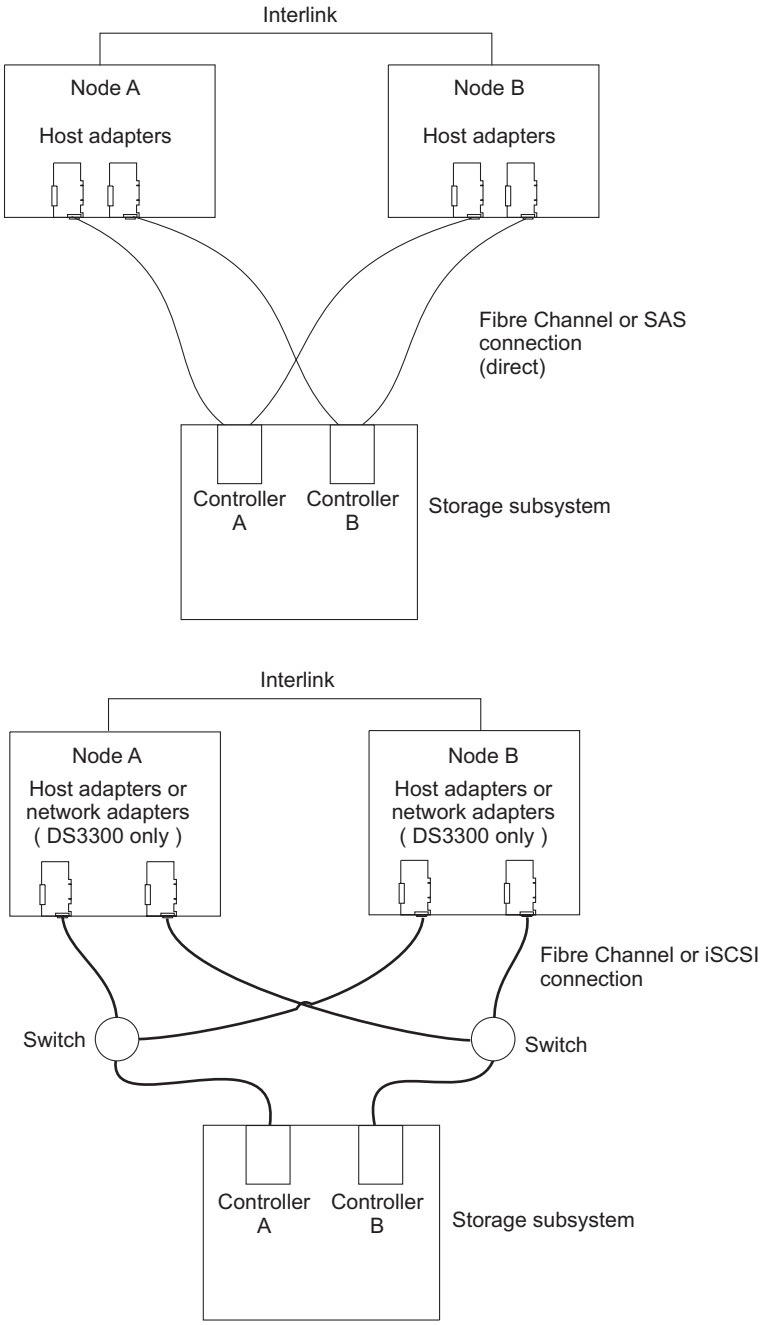

Figure 8. Installing the storage subsystem in a Fibre Channel, iSCSI, or SAS network

Host bus adapters

For specific host bus adapter installation requirements and procedures, see the documentation that comes with the host bus adapter. The following considerations apply:

- To use the dual-path configuration, perform the following tasks:
  - Install two host adapters in each node.
  - (Fibre Channel host bus adapters only) Connect two fiber-optic cables from each node to the storage subsystem.

- If you connect the storage subsystem through a Fibre Channel-Arbitrated Loop (FC-AL), make sure that each adapter on the loop is assigned a unique hard ID. For instructions about changing hard IDs, see the documentation that comes with the host bus adapter.
- Make sure that the correct device driver is installed for the host adapter. See the readme file in the \HostAdapter directory on the *IBM System Storage DS3000 Support* CD for information about supported host adapters and device drivers.

Storage subsystems

For specific hardware installation requirements and procedures, see the documentation that comes with the hardware. If you are managing storage subsystems directly, you must connect Ethernet cables to both controllers in each storage subsystem.

Installing the Storport miniport host bus adapter device driver

An IBM Fibre Channel, iSCSI, or SAS host bus adapter provides the interface between a host server and a DS3000 storage subsystem. IBM Fibre Channel, iSCSI, and SAS host bus adapters are high-performance, direct memory access, bus-master host adapters that are designed for high-end systems. The Fibre Channel host bus adapters support all Fibre Channel peripheral devices that support private-loop, direct-attach, and fabric-loop attachment. The IBM host bus adapter device driver enables the operating system to communicate with the host bus adapter.

The Storage Manager software provides the support of a Fibre Channel, iSCSI, or SAS host bus adapter device driver that is based on the Microsoft Storport miniport device-driver model. The Storport miniport device-driver model was introduced in the Microsoft Windows Server 2003 release as a replacement for the SCSIport miniport device driver model. It is the only supported device driver model for Windows Server 2003 x64 editions, which support the AMD64 and EM64T servers.

To support Storport miniport device drivers, Service Pack 2 and the latest Storport miniport hotfix must be installed in the Windows Server 2003 operating system. You can download the latest Storport hotfix from http://www.support.microsoft.com/kb/932755/en-us/. See the Storage Manager readme file for Microsoft Windows operating systems for other requirements, such as controller firmware versions or other Microsoft updates, and for information about the latest versions of the hotfix.

Installing the Storage Manager software in a Windows Server 2003 or Windows Server 2008 cluster environment

To install the Storage Manager software and cluster service software on Windows Server 2003 or Windows Server 2008, complete the following steps:

1. Make sure that the host bus adapter and device driver are installed in each cluster node. For information about host bus adapter and device-driver installation, see “Installing the Storport miniport host bus adapter device driver.”
2. Install the Storage Manager software on the host server that will be the first node of the cluster. For installation instructions, see “Installing the Storage Manager host software packages” on page 34.

   Note: Before you install the Storage Manager software on an existing storage subsystem, see your hardware documentation for any specific

configuration instructions. A specific configuration might be required for the hardware to support the Storage Manager software in a cluster configuration.

3. Complete the procedures in Chapter 8, “Completing the Storage Manager software installation and configuration,” on page 65, specifically to create LUNs that will be used as cluster disks and to make sure that the host type of the host group or host ports that these LUNs are mapped to are set to Windows 2000/Server 2003 Clustered.

   Note: You might have to restart the first node of the cluster to see the newly added logical drives (LUNs).

4. Install the Storage Manager software on the second node of the cluster.

   Note: You must install the MPIO and SMutil software packages. You do not have to install all of the Storage Manager software packages unless you want to manage the storage subsystem from this cluster node.

   Repeat step 4 for each additional node of the cluster.

5. Format all shared logical drives as New Technology File System (NTFS), assign volume labels, and specify a drive letter for each.

   Important: You must make sure that the permanent (sticky) drive letters that are assigned to LUNs in the first cluster node are available (not used) in the rest of the cluster nodes. All of the nodes in the cluster must have the same drive letters on each shared drive. If you do not assign permanent drive letters, Windows might assign different drive letters on each node, which will prevent the cluster disks from operating correctly. To make sure that Windows assigns the same drive letter to the partition on all cluster nodes, assign a permanent drive letter.

6. Install the cluster server software on the first node of the cluster. See the applicable Microsoft Cluster Server (MSCS) documentation for the correct procedure to install the cluster server software.

Important: During the installation of a Microsoft cluster solution, you must perform the following steps on any additional node in the cluster:

a. Start the Cluster Administrator.
b. From the Cluster Administrator, click **Join an existing cluster**.
c. Enter the name of the cluster that was used in forming the cluster on the node 1.
d. After you have established a connection to the cluster, click **Advanced** on the Select Computer page.
e. Click **Advanced (minimum) configuration**.

7. Install the cluster server software on the second node of the cluster. See the applicable MSCS documentation for the correct procedure to install additional nodes in the cluster server.

   Note: During installation, specify that you want to join the existing cluster. You can add one cluster node at a time or all of the remaining cluster nodes at the same time. You should add cluster nodes one at a time.

8. If all node names are not displayed on the left side of the Cluster Administrator window, reinstall the cluster server software. If the problem remains, contact your technical-support representative.

9. In the Cluster Administrator window, make sure that all of the cluster disk groups can be varied online and offline with no problems.
10. Manually move the cluster disk groups from the first cluster node to each of the nodes in the cluster, making sure that they can be brought online. If they can be brought online with no problems, you are ready to continue with the application software installation. If you experience any problems, call your technical-support representative.

Configuring storage management

After you install the Storage Manager software, complete the following tasks that are described in Chapter 8, "Completing the Storage Manager software installation and configuration," on page 65.

- Performing an initial automatic discovery of storage subsystems
- Adding storage subsystems
- Naming storage subsystems
- Configuring alerts
- Configuring host access
- Defining host groups
- Creating arrays and logical drives
- Managing iSCSI settings (DS3300 only)
- Downloading controller firmware and NVSRAM

Chapter 5. Installing the Storage Manager software in a Linux configuration

This chapter describes how to install the Storage Manager software in a Linux operating system environment.

Note: This document does not provide information about using Linux on POWER-based hosts.

Installation overview

Before you install the Storage Manager software, read the following information:

- Read the Storage Manager software readme file for your operating system before you install the software. A readme file contains important information that was not available when this document was prepared.
- Make sure that you have completed all preparation tasks described in Chapter 2, "Preparing for installation," on page 21.
- Make sure that the network components are set up and operating correctly.
- Make sure that you have the host and controller information that you need for the software to operate.

Install the software on each host server in the following order:

1. Install the IBM host bus adapter device driver for Linux operating systems.
2. Install Linux MPP.
3. Install the Storage Manager 2 software according to the system type that you want.

Note: For Storage Manager 2, the default installation directory for the host software packages is /opt/IBM_DS3000.

Installing the IBM host bus adapter device driver

An IBM host bus adapter provides the interface between a host server and a DS3000 storage subsystem. IBM DS3000 host bus adapters are high-performance, direct memory access, bus-master host adapters that are designed for high-end systems. The Fibre Channel host bus adapters support all Fibre Channel peripheral devices that support private-loop, direct-attach, and fabric-loop attachment. The IBM host bus adapter device driver enables the operating system to communicate with the host bus adapter.

Install the host bus adapter device driver *before* you install the Storage Manager software. See the readme file that is included in the device-driver package for installation instructions for your operating system. For more information, see the *Installation and User's Guide* that comes with the host bus adapter.

The current readme file and latest IBM host bus adapter device drivers are available for download at http://www.ibm.com/servers/storage/support/disk/.

Storage Manager software for Linux

The DS3000 Storage Manager packages are available for two kernel versions of Linux operating systems on the *Support CD* and at http://www.ibm.com/servers/storage/support/. These packages are for servers with Intel and AMD architecture x86 32-bit (IA-32) and x86 64-bit (AMD64 and EM64T) processors only.

The Storage Manager software packages contain the following components for Linux:

- Storage Manager Runtime (SMruntime)
- Storage Manager Utility (SMutil)
- Storage Manager Client (SMclient)
- Linux MPP

Note: Linux MPP is provided as a separate package from the Storage Manager software package for Linux. The Linux MPP installs the multipath proxy (MPP) multipath driver for Linux. The Linux MPP is different from the Storage Manager RDAC for Windows.

Install the Storage Manager Client (SMclient) component on the management station. Installing SMclient on a host server is optional.

Install the following components only on the host:

- Storage Manager Utility (SMutil)
- Linux MPP
- Storage Manager Agent (SMagent)

Management station components

Install the following components on the management station. Installing these components on a host server is optional.

- **Storage Manager Runtime (SMruntime)**

  This component is automatically installed with the Storage Manager Client. It contains the Java™ runtime environment that is needed to run the other software packages.
- **Storage Manager Client (SMclient)**

  This component is needed if you want to manage the storage subsystem from a host server or a management station.

Host components

Install the following components only on the host:

- **Storage Manager Utility (SMutil)**

  This component is packaged with the SMclient package and contains the hot_add and SMdevices utilities.
- **Linux MPP**

  This component provides multipath failover/failback capability.

  Note: Linux MPP is not packaged with the other software components in the Storage Manager package for Linux operating systems. Also, there is a different version of RDAC for each Linux kernel version, so check the latest readme file to make sure that you have the correct version for your Linux kernel.

- **Storage Manager Agent (SMagent)**

  This component is required if you want to use the host-agent (in-band) management method for the DS3300 and DS3400 storage subsystem. You must install Linux MPP before you install SMagent.

  Notes:

  1. In a Linux operating system environment, the preferred method for managing DS3000 storage subsystems is the direct (out-of-band) method.
  2. As of the date of this document, the DS3200 does not support in-band management.

Installing the Storage Manager 2 software using the installation wizard

The DS3000 Storage Manager installation wizard is a Java-based interactive method for you to choose the software packages that you want to be installed automatically on the host system. The installation wizard installs the following software packages on the Linux host:

- SMclient
- SMagent
- SMutil

Note: Before you install the Storage Manager software, make sure that a graphics adapter is installed on the Linux host.

To install the Storage Manager software by using the installation wizard, complete the following steps:

1. Make sure that you have root privileges, which are required to install the software.
2. Insert the *IBM System Storage DS3000 Support* CD into the CD drive, and if necessary, mount the CD drive.
3. Copy the SMIA-LINUXxxx host software installation package from the CD to a directory on your system.

   Note: The latest version of the Storage Manager host software packages are available for download at http://www.ibm.com/servers/storage/support/.
4. Change to the directory in which you copied the SMIA-LINUXxxx package and type the file name of the SMIA-LINUXxxx file in the following format to start the Storage Manager installation wizard:

   ```
   ./SMIA-LINUXxxx-02.17.xx.xx.bin
   ```

   The Storage Manager installation wizard Introduction window opens.
5. Follow the instructions in each window of the wizard. When you select the installation type, you can choose one of the following options (see Figure 9 on page 48):
   - **Typical (Full) Installation:** Installs all Storage Manager software packages
   - **Management Station:** Installs SMruntime and SMclient
   - **Host:** Installs SMruntime, SMagent, and SMutil
   - **Custom:** Enables you to select which packages you want to install

Figure 9. Select Installation Type window

Note: The Storage Manager software packages are installed by default in the /opt/IBM_DS3000 directory.

The Linux MPP package

Installation of the RDAC package is required only if the system is a host. You must install RDAC on each host server. The RDAC package installs the multipath device driver that is needed for controller failover support. A system restart is required when you install the RDAC device driver package.

Notes:

1. You must install the host bus adapter device driver before you install RDAC. For information about supported levels of host bus adapter device drivers, see the Storage Manager 2 readme file.
2. Linux MPP is provided separately from the Storage Manager 2 host software package. There are two Linux MPP packages, one for each type of kernel:
   - 2.6 kernel (RHEL 4, SLES 9, and SLES 10) for RDAC Revision B
   - 2.6 kernel (RHEL 5 and SLES 10 SP1) for RDAC Revision C

   Be sure to install the correct Linux MPP for your system.

   Important: Neither of the Linux MPP packages can be used for Linux on POWER-based servers.
3. Always see the readme file that is included with the Linux MPP package for the latest instructions for installing Linux MPP, including any dependencies or limitations.

4. This Linux MPP version does not support auto-volume transfer/auto-disk transfer (AVT/ADT) mode. AVT/ADT is disabled by default so that the Linux MPP can function correctly.

To unpack the Linux MPP source files from the directory in which you placed the RDAC source .tgz file, at the command prompt, type the following command and press Enter:

```
tar -zxvf filename.tar.gz
```

where *filename* is the name of the Linux MPP source file.

The source files are extracted into the *yourdirectory*/linuxrdac-*version* directory (where *version* is the RDAC number; for example, linuxrdac-09.01.B5.39).

For detailed procedures for compiling and installing the device-driver modules, see "Installing Linux MPP."

Installing Linux MPP

The Linux MPP provides multipath failover/failback support for the logical drives in the DS3000 storage subsystem that are mapped to the Linux host server. The Linux host server must have I/O (depending on the host bus adapter type) connections to the host ports of both controllers A and B of the DS3000 storage subsystem (if you have a dual-controller configuration).

For the latest related dependencies, see the Storage Manager readme file. The readme file is available on the *Support* CD and at http://www.ibm.com/servers/storage/support/disk/.

For the latest supported DS3000 storage subsystem models, host bus adapters, device drivers, Linux kernel versions and updated readme, see http://www.ibm.com/servers/storage/support/disk/.

Note: Deviations from the listed code levels are not supported. For more information, contact your technical-support representative.

Limitations

- The Linux SCSI layer does not support skipped (sparse) LUNs. If the mapped LUNs are not contiguous, the Linux kernel will not scan the remaining LUNs. Therefore, LUNs following the skipped LUN will not be available to the host server. Always map LUNs by using consecutive LUN numbers.
- If a host server with Fibre Channel host bus adapters has multiple host bus adapter ports and each port sees both controllers (over an unzoned switch), the Linux MPP driver might return I/O errors during controller failover. In this case, use multiple unconnected Fibre Channel switches to zone the Fibre Channel switch into multiple zones so that each host bus adapter port sees only one controller in a DS3000 storage subsystem.
- It is not possible to load the virtual host bus adapter device driver if no storage subsystem is attached. The workaround for this inability is to connect the host server to the DS3000 storage subsystem and run the hot_add utility.

  Note: If no LUN is mapped to the host server partition on the DS3000 storage subsystem, the hot_add utility will not bring up the mpp_Vhba module.

- The Linux MPP driver does not support LUN deletion. You must restart the server after you delete mapped logical drives.
- Do not load or unload the RDAC driver stack, which includes the mpp_Upper and mpp_Vhba tools, and the low level host bus adapter device driver, by using the modprobe kernel module utility. Any use of modprobe on the RDAC driver stack is the responsibility of the user. IBM does not support the use of modprobe with the RDAC driver stack. Use of rmmod to remove all the drivers in the RDAC driver stack, in order, is also not supported. Whenever you must unload the driver stack, restart the system.

Prerequisites

- The Linux MPP driver is released as a source-code package in the format of a gunzip compressed tar file. To unpack the driver source package, type the following command in the Linux console window: `tar -zxvf rdac-LINUX-xx.xx.xx.xx-source.tar.gz`, where *xx.xx.xx.xx* is the release version of the RDAC driver. The source files are extracted into the linuxrdac-*version* directory (where *version* is the RDAC number; for example, linuxrdac-09.01.B5.39).
- Build and install the host bus adapter device driver on the host server before you install the Linux MPP driver. See the host bus adapter device driver readme file or the host bus adapter *Installation and User's Guide* for instructions for installing the device driver. If you have to build the host bus adapter device driver from the source tree, the device driver source tree is included in the source-code package. This device driver must be loaded before the RDAC installation.
- The host server can have different host bus adapters from multiple vendors or different host bus adapter models from the same vendors; however, only one model of the host bus adapter can be connected to the DS3000 storage subsystems.
- Make sure that you install the kernel source tree against which to build the Linux kernel version before you install the RDAC driver package.

For the SUSE Linux Enterprise Server 9 distribution only

To install and set up the Linux MPP for a SUSE Linux Enterprise Server 9 environment, complete the following steps:

1. Install the kernel-source from the SUSE distribution.
2. Create a soft link to the kernel source by typing the following command:
   `ln -sf /usr/src/linux-version /usr/src/linux`
3. To make sure that the kernel version is synchronized between the device driver and the running kernel, type the following commands in the Linux console window. Press Enter after you type each command:
   - `cd /usr/src/linux`
   - `make mrproper` (completely clean the kernel tree)
   - `- cp /boot/config-`uname -r` .config` (copy the new configuration file)
   - `make oldconfig` (update configuration using the .config file)
   - `make dep` (rebuild the dependencies)
   - `make modules` (build the modules) (not required on newer kernel versions)

Building the RDAC driver for SUSE Linux and Red Hat Linux

1. Change to the linuxrdac directory.
2. To remove the old driver modules in that directory, type the following command and press Enter:

```
make clean
```

3. To compile all driver modules and utilities in a server with multiple processors (SMP kernel), type the following command and press Enter:

   ```
   make
   ```

Installing the RDAC driver

1. To copy driver modules to the kernel module tree and build the new RAMdisk image (mpp.img), which includes RDAC driver modules and all driver modules that are needed during boot time, type `make install` and press Enter.
2. Follow the instructions that are displayed at the end of the build process to add a new boot menu option, which uses /boot/mpp-*kernel version*.img as the initial RAMdisk image.
3. Near the end of the Linux MPP installation, if you see the error message `All of your loopback devices are in use`, and the RDAC RAMdisk is not created, and the installation fails, type the following commands in the Linux console window:

   `insmod loop` (This command loads the loopback device driver onto the kernel.)

   `make uninstall` (This command uninstalls the previous, unsuccessful RDAC driver.)

   `make install` (This command installs the RDAC driver again.)

The following instructions might work in certain Red Hat kernel versions. Add `ramdisk_size=15000` as a kernel boot parameter in the new boot option, similar to the following `grub.conf` example.

Note: The actual text might be different, depending on the system setup configuration.

```
title Red Hat Linux Advanced Server-up (2.4.9-e.27smp)
root (hd0,6)
kernel /vmlinuz-2.4.9-e.27smp ro root=/dev/hda7 ramdisk_size=15000
initrd /mpp-<kernel version>.img
```

RDAC driver post-installation

1. Restart the system by using the New Boot Menu option.
2. Type `lsmod` to make sure that the driver stack is installed correctly.

   Note: On Red Hat distributions, the following modules should be installed: scsi_mod, sd_mod, sg, mpp_Upper, mpp_Vhba(*), and host bus adapter device drivers. On SUSE Linux distributions, the following modules should be installed: sg, mpp_Upper, mpp_Vhba(*), and host bus adapter device drivers.
3. To make sure that the RDAC driver discovered the available physical LUNs and created virtual LUNs for them, type `ls -lR /proc/mpp` and press Enter.

   You can now issue I/Os to the LUNs.
4. If you make any changes to the MPP configuration file (/etc/mpp.conf) or the /var/mpp/devicemapping persistent binding file, run `mppUpdate` to rebuild the RAMdisk image and to include the new file so that the new configuration file (or persistent binding file) can be used on any subsequent system restart.

To capture all debug and error messages for the MPP driver, the /etc/syslog.conf file must have entries for `kern.debug`, `kern.notice`, `kern.info`, and `kern.warning`.

Proc entries

To make sure that the RDAC driver discovered the available physical LUNs and created virtual LUNs for them, type `ls -lR /proc/mpp` and press Enter.

The Linux operating system provides a /proc file system that is a special memory-only, software-created file system that is used by the kernel to export device-driver information to the user space.

The proc pseudo-filesystem is mounted to /proc. The Linux SCSI subsystem proc file system directory is /proc/scsi. By convention, each host bus adapter device driver creates a subdirectory under /proc/scsi.

The Linux MPP driver proc entries are as follows:

- /proc/mpp

  Entry for the MPP driver.
- /proc/scsi/mpp/*adapter_number*

  Entry for the MPP virtual host adapter. This can differ from system to system and is assigned by the SCSI middle layer.
- /proc/mpp/*storage_sys_name*

  Entry for each subsystem that is visible to the host.
- /proc/mpp/*storage_sys_name*/controller*A/B*

  Entries for the two targets on each subsystem as seen by the host. Each storage subsystem has two controllers.
- /proc/mpp/*storage_sys_name*/controller*A/B*/*low_level_driver*/*HCT#*

  The *low_level_driver* can be any one of QLogic, Emulex, LSI Logic host bus adapters, or iSCSI software initiators. *HCT#* can be the *Host#* (host number of the low-level driver that is assigned by the SCSI middle layer), *Channel#* (depending on whether the host bus adapter is a single-port or dual-port), or *Target#* (target number that is assigned to that controller on that subsystem by the low-level host bus adapter device driver).
- /proc/mpp/*storage_sys_name*/controller*A/B*/*low_level_driver*

  The logical drives or LUN numbers of logical drives, as mapped on the host partition on the storage subsystem and seen through that path, or initiator (host)-target combination.

Persistent naming

Linux SCSI device names might change when the host system restarts. The preferred method is to use a utility, such as devlabel, to create user-defined device names that will map devices according to a unique identifier, called a UUID.

Uninstalling and reinstalling (updating) the RDAC driver package

To uninstall the RDAC driver package, type `make uninstall` and press Enter.

Note: To reinstall or update the RDAC driver package, type `make uninstall`, and then type `make install` under the /linuxrdac directory in the new RDAC driver source code bundle.

Kernel update

After you apply the kernel update and boot into the new kernel, to build the MPP Initrd image for the new kernel, complete the following steps:

1. Change the directory to the Linuxrdac source code directory.

2. Type the `make uninstall` command.
3. Follow the driver building and installation procedure that is described in "Building the RDAC driver for SUSE Linux and Red Hat Linux" on page 50 and "Installing the RDAC driver" on page 51.

Initial RAMdisk image (initrd)

The Initial RAMdisk Image (initrd image) is automatically created when you install the driver by typing the `make install` command. The boot loader configuration file must have an entry for this newly created image.

The initrd image is in the boot partition with the mpp-*uname-r*.img file name (for example, mpp-2.4.21-9.ELsmp.img).

For a driver update, if the system already has an earlier entry for MPP, the system administrator must modify only the existing MPP entry accordingly in the boot loader configuration file. In most cases, no change is required if the kernel version is the same.

To create a new initrd image, type `mppUpdate`, which overwrites the earlier image file with the new image file.

If you have to add third-party drivers to the initrd image, edit the /etc/sysconfig/kernel file (SUSE Linux) or the /etc/modules.conf file (Red Hat Linux) with the independent software vendor party driver entries. Run mppUpdate to create a new RAMdisk image.

Adding and deleting mapped logical drives (LUNs)

Linux MPP supports the rescanning of a newly mapped LUN without restarting the server. The utility program is packaged with the Linux MPP driver. You can start it by entering either the hot_add or mppBusRescan command. The hot_add command is a symbolic link to mppBusRescan. There are man pages for both commands.

The Linux MPP driver does not support LUN deletion. After you delete mapped logical drives, you must restart the server.

Removing the temporary installation files

To remove the temporary installation files from the temporary directory, use one of the following methods:

- Restart the host. All of the entries in the /tmp file system are deleted when the host is restarted.
- Type the following commands:

```
cd /tmp
cd installation_directory_name
rm *.* -r
```

Uninstalling the Storage Manager software

The procedure in this section is for uninstalling an earlier version of the Storage Manager software from one or more Linux management stations or hosts.

Note: You do not have to restart the host server after you remove a software component. During the software removal process, the host keeps the

existing storage subsystem mappings and storage partition configurations, which the new client software recognizes.

The DS3000 Storage Manager installation wizard creates an Uninstall directory in the directory in which you installed the Storage Manager host software. The default file name for this directory is /opt/IBM_DS3000. The directory contains a file named Uninstall_IBM_DS3000. To uninstall the host software, change to this directory and type the following command:

```
# sh ./Uninstall_IBM_DS3000
```

When the wizard opens, follow the instructions.

Configuring storage management

After you install the Storage Manager software, complete the following tasks that are described in Chapter 8, “Completing the Storage Manager software installation and configuration,” on page 65.

- Performing an initial automatic discovery of storage subsystems
- Adding storage subsystems
- Naming storage subsystems
- Configuring alerts
- Configuring host access
- Defining host groups
- Creating arrays and logical drives
- Managing iSCSI settings (DS3300 only)
- Downloading controller firmware and NVSRAM

Chapter 6. Installing the Storage Manager software in a standard NetWare configuration

This chapter describes how to install the Storage Manager software in a Novell NetWare operating system environment.

Notes:

1. As of the date of this document, the DS3300 storage subsystem does not support the Novell NetWare operating system.
2. The storage subsystem controller firmware supports a DS3000 storage subsystem connection to a NetWare host; however, as of the date of this document, the Storage Manager software is not supported on NetWare management stations.

To manage a DS3000 storage subsystem that is connected to a NetWare host server, you must install the Windows or Linux version of the Storage Manager SMclient program on a management station and make an out-of-band management connection to the DS3000 storage subsystem. For more information about how to install the Storage Manager Client program on a Windows management station, see Chapter 3, “Installing the Storage Manager software in a standard Windows configuration,” on page 31 or Chapter 5, “Installing the Storage Manager software in a Linux configuration,” on page 45.

This chapter describes how to install the host bus adapter device driver, the LSIMPE.cdm driver, and the NetWare native failover device driver. For correct installation, complete all preparation tasks that are described in Chapter 2, “Preparing for installation,” on page 21.

Important: Always check the Storage Manager software readme file for your operating system before you install the software. A readme file contains important information that was not available as of the date of this document.

Installing the IBM host bus adapter device driver

An IBM host bus adapter provides the interface between a host server and a DS3000 storage subsystem. IBM host bus adapters are high-performance, direct memory access, bus-master host adapters that are designed for high-end systems. The IBM Fibre Channel host bus adapters support all IBM Fibre Channel peripheral devices that support private-loop, direct-attach, and fabric-loop attachment. The IBM Fibre Channel, iSCSI, and SAS host bus adapter device drivers enable the operating system to communicate with the host bus adapter.

See the readme file that is included in the device driver package for installation instructions for your operating system. For more information, see the *Installation and User's Guide* that comes with the host bus adapter.

Installing the LSIMPE device driver and NetWare native failover device driver

The NetWare native failover device drivers are the only supported failover device drivers for the Novell NetWare operating system environment. The NetWare native failover device drivers (MM.NLM and NWPA.NLM) are installed by default with NetWare 6.5.

Important:

1. Always use the Novell NetWare native failover device driver in the latest support pack for a particular NetWare operating system version. Also, use the latest version of the LSIMPE.CDM file from either the latest Novell Support Pack or the version that is included with the IBM host bus adapter device driver for NetWare, which is available at the IBM DS3000 support Web site.
2. For the latest instructions about failover/failback configuration and setup, see the Storage Manager readme file.

The LSIMPE.CDM device driver is used in a Novell NetWare environment to enable the Novell native multipath device driver to recognize the NetWare host-mapped logical drives that are created on DS3000 storage subsystems. The LSIMPE.cdm device driver is a custom driver module that is packaged with the IBM DS3000 host bus adapter device driver and the Novell operating-system distribution CD.

See the IBM host bus adapter device-driver readme file for the current LSIMPE.cdm device driver. You can find the latest readme file at http://www.ibm.com/servers/storage/support/disk/.

Note: The embedded lsimpe.cdm device driver for Novell NetWare 6.5 Service Pack 7 does not function with the DS3000 controllers. For failover to work correctly, you must use the files from http://support.novell.com/docs/Readmes/InfoDocument/patchbuilder/readme_5006860.html.

Chapter 7. Using a DS3000 storage subsystem with a VMware ESX Server configuration

Important: The DS3000 Storage Manager software is not available for VMware ESX Server operating systems as of the date of this document. Therefore, to manage DS3000 storage subsystems with a VMware ESX Server host, you must install the Storage Manager Client software (SMclient) on a Windows or Linux management workstation. (This can be the same workstation that you use for the Web-based VMware Management Interface.)

For instructions for installing the DS3000 Storage Manager 2 Client software (SMclient) on a Windows or Linux management station, see Chapter 3, “Installing the Storage Manager software in a standard Windows configuration,” on page 31 or Chapter 5, “Installing the Storage Manager software in a Linux configuration,” on page 45.

For more information about using a DS3000 storage subsystem with a VMware ESX Server host, see the Storage Manager software readme file.

Sample configuration

Figure 10 shows a sample VMware ESX Server configuration.

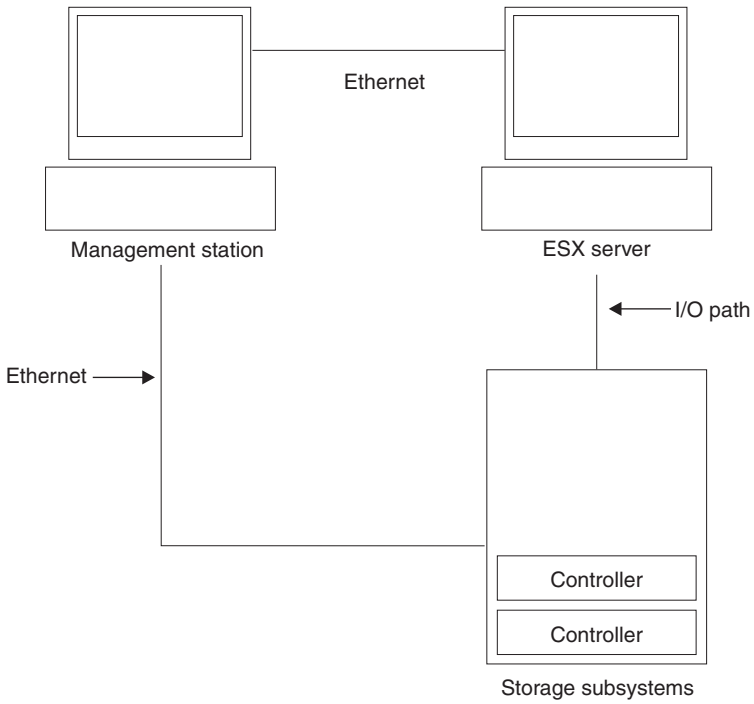

Figure 10. Example of a VMware ESX Server configuration

Software requirements

This section describes the software that is required to use a VMware ESX Server host operating system with a DS3000 storage subsystem.

Management station

The following software is required for the Windows or Linux management station:

1. SMruntime (Linux only)
2. SMclient (Windows and Linux)

Note: The mapping storage partition host type for VMware is lnxclvmware.

Host (VMware ESX Server)

The following software is required for the ESX Server:
VMware ESX Server 2.5.4, VMware ESX Server 3.0.1, VMware ESX Server 3.0.2, VMware ESX Server 3.5, VMware ESX Server 3.5.1, and VMware ESX Server 3.5.2

For VMware ESX Server restrictions, see the Storage Manager software readme file.

Notes:

1. Use VMware Tools for guest operating system software.
2. The DS3200 storage subsystem is supported on VMware ESX Server 3.5.1 or later.
3. The DS3300 storage subsystem is supported on VMware ESX Server 3.5 or later.

Clustering

For information about Windows clustering with VMware ESX Server, see the ESX Server *Installation Guide* at http://www.vmware.com/support/pubs/.

Configuring storage subsystems

Before you can configure storage subsystems, you must physically configure the host server, SAN fabric, and DS3000 controllers (no SAN fabric is required with the DS3200), assign initial IP addresses to the controllers, and install SMclient on the Windows or Linux management station. These procedures are described in this document in the following sections.

Setting up the VMware ESX Server host
For more information about setting up the VMware ESX Server host, see the documentation and readme files at http://www.vmware.com/support/pubs/.

For information about installing a VMware ESX Server operating system on an IBM server, see http://www.ibm.com/systems/support/.

Setting up the SAN fabric
For information about setting up the SAN fabric, including information about zoning, see http://www.vmware.com/support/pubs/.

Assigning initial IP addresses
For information about assigning initial IP addresses to the DS3000 controllers, see “Step 3: Assigning IP addresses to hosts and controllers” on page 25.

Installing SMclient on a Windows or Linux management station
For information about installing SMclient on a Windows management station, see Chapter 3, “Installing the Storage Manager software in a standard Windows configuration,” on page 31.

For information about installing SMclient on a Linux management station, see Chapter 5, “Installing the Storage Manager software in a Linux configuration,” on page 45.

Completing storage management installation and configuration
For information about completing storage management installation and configuration tasks, see Chapter 8, “Completing the Storage Manager software installation and configuration,” on page 65.

Mapping LUNs to a storage partition

This section contains notes about LUN mapping that are specific to VMware ESX servers. For the procedures that describe how to map the LUNs to a partition, see “Mapping LUNs to a partition” on page 77.

When you map LUNs on VMware, note the following information:

- On each partition, you must map a LUN 0.
- Always map the LUNs using consecutive numbers, starting with LUN 0. For example, map LUNs to numbers 0, 1, 2, 3, 4, 5, and so on, without skipping any numbers.
- LUN sharing across multiple ESX servers is supported only when you are configuring VMotion enabled hosts. On LUNs that are mapped to multiple ESX Servers, you must change the access mode to Shared. You can map the LUNS to a host group for the ESX servers, so that they will be available to all members of the host group. For more information about Windows Clustering with ESX Server, see the ESX Server *Installation Guide* at http://www.vmware.com/support/pubs/.

VMware failover setup instructions

The only supported failover mechanism that you can use with a DS3200 or DS3400 storage subsystem that is attached to a VMware host is the MRU (most recently used).

Note: The default failover that is selected when you create new VMware guest operating system partitions is MRU, so no changes are required.

The MRU failover mechanism enables path failover and path recovery, but no automatic failback.

To rebalance your LUNs, complete the following steps:

1. Select the Storage Manager 2 software and open the Subsystem Management window.
2. Click the **Support** tab.
3. Select **Manage Controllers**, and then select **Redistribute Logical Drives**.

   If you select **Fixed** for the failover mechanism, you cannot failback to the preferred path. Any subsequent failure that occurs after the initial problem will cause you to lose access to the logical drives assigned to the non-preferred path.

VMware iSCSI Software Initiator Configuration instructions

To configure a VMware iSCSI Software Initiator, complete the following steps:

1. Create a VMkernel port for the software initiator.
2. Create a virtual switch, and then select the network adapter that the virtual switch uses.
3. Enter the IP address and subnet mask for the IP settings.

When you set up target discovery addresses for the software initiator, use an address from each network, if multiple networks are being used.

The following illustration shows a sample configuration in which both VNIC 0 and VNIC 1 are assigned to the same virtual switch (Virtual switch 0). This configuration enables all the ports on the DS3300 to be accessed by the host.

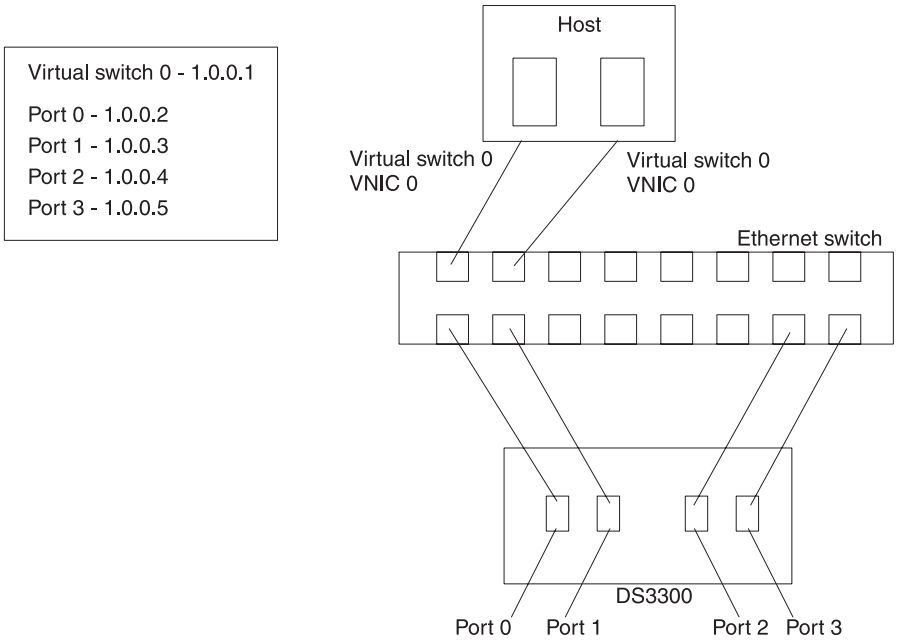

Figure 11. Sample configuration showing VNIC 0 and VNIC 1 assigned to the same virtual switch

The following illustration shows a sample configuration in which VNIC 0 and VNIC 1 are assigned to different networks. The ports on the DS3300 must be assigned IP addresses so that at least one port from each controller on the DS3300 is accessible to each network.

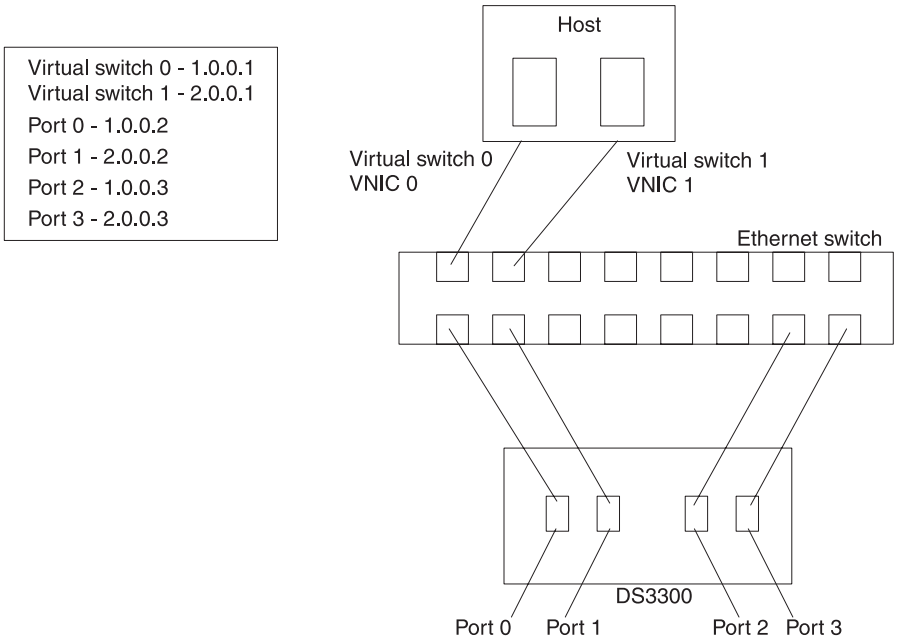

Figure 12. Sample configuration showing VNIC 0 and VNIC 1 assigned to different networks

For more information about setting up the iSCSI software initiator, see http://www.vmware.com/pdf/vi3_35/esx_3/r35/vi3_35_25_iscsi_san_cfg.pdf.

Configuring SAS HBA BIOS timeout settings for correct failover

To make sure that the DS3200 storage subsystem provides correct path failover during heavy I/O in a VMware environment, you must reconfigure two timeout values in the BIOS of the SAS HBA. Failure to reconfigure two timeout values in the BIOS of the SAS HBA can cause I/O timeouts. The values that you must change are **Report Device Missing Delay** and **I/O Device Missing Delay**.

To change the SAS HBA BIOS timeout settings, complete the following steps:

1. Restart the host with the SAS HBAs.
2. When you are prompted during POST, press Ctrl+C to start the LSI Corp (SAS) Configuration Utility.

   Note: If you experience PCI Resource Allocation Errors that prohibit the configuration utility from initializing, you might be forced to disable some PCI devices or control the ROM execution space. This error message indicates that the system ROM space is full and there is no more room for additional adapters that use ROM space. For more information, see the Retain Tips for “1801 PCI Allocation Errors” at http://www.ibm.com/systems/support/.
3. On the Adapter List screen, use the arrow keys to select a SAS HBA, and then press Enter. The Adapter Properties screen is displayed.
4. Select **Advanced Adapter Properties** and press Enter.
5. Select **Adapter Timing Properties** and press Enter.

6. Change the **Report Device Missing Delay** to 10 seconds by pressing the + key, - key, or Spacebar.
7. Change the **IO Device Missing Delay** to 0 seconds by pressing the + key, - key, or Spacebar.

   Note: For VMware ESX Server 3.5.2, change the **Report Device Missing Delay** to 144 seconds and change the **IO Device Missing Delay** to 8 seconds.
8. Repeat step 3 on page 61 through step 7 for each SAS HBA in the host servers.

Configuring DS3000 storage subsystem controller sense data for VMware Windows guest operating systems

You can configure the DS3000 storage subsystem controllers to return either the Unit Attention or Not Ready message when quiescent. A DS3000 controller that is running Windows as a guest operating system returns Not Ready sense data when it is quiescent. Returning Unit Attention sense data might cause the Windows guest operating system to fail during a failover operation.

Note: As an alternative to using the command shell as described in the following procedure, you can use the Script Editor in the DS3000 Storage Manager software.

To configure the DS3000 controllers to return Not Ready sense data, complete the following steps:

1. Change to the directory path where the SMcli executable file is located.
2. In a shell window of the management station, type the following command to determine the index for the VMLNXCL host type:

   ```
   SMcli ip_addr_for_controllerA ip_addr_for_controllerB
   -c "show storagesubsystem hosttopology";
   ```

   Press Enter.
3. Type the following commands to enable controller A to return Not Ready sense data. Press Enter only after you enter all of the commands.

   Notes:

   - In the following commands, the value 13 is used for the index that corresponds to VMLNXCL in the NVSRAM host type definitions returned by this command. If your controllers use a different value for the index for VMLNXCL, substitute that index value for 13 in the following commands.
   - The following commands reset the controller. The controller is temporally unavailable until the controller reset operation is completed.

   ```
   SMcli ip_addr_for_controllerA ip_addr_for_controllerB
   -c "set controller [a] hostNVSRAMBYTE [13,0x12]=0x01;
   set controller [a] hostNVSRAMBYTE [13,0x13]=0x00;
   reset Controller [a]";
   ```

   Before proceeding to the next step, wait until controller A has finished restarting and the storage subsystem status is Optimal.

4. Type the following commands to enable controller b to return Not Ready sense data. Press Enter only after you enter all of the commands.

   Note: The following commands reset the controller. The controller is temporally unavailable until the controller reset operation is completed.

```
SMcli ip_addr_for_controllerA ip_addr_for_controllerB
-c "set controller [b] hostNVSRAMBYTE [13,0x12]=0x01;
set controller [b] hostNVSRAMBYTE [13,0x13]=0x00;
reset Controller [b]";
```

Required update for VMware

The Red Hat Enterprise Linux 5 guest operating system file systems might become read-only in the event of a lot of I/O retries or path failover of the ESX Server host storage. For more information, see http://kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=1001778.

Chapter 8. Completing the Storage Manager software installation and configuration

This chapter contains information about using the Enterprise Management and Subsystem Management features of the Storage Manager 2 software to complete the installation tasks for the Windows, Linux, and NetWare operating system environments.

Note: As of the date of this document, the DS3000 Storage Manager 2 software is not available for NetWare operating systems. To configure the Storage Manager 2 software with your NetWare host, complete the tasks in this section by using SMclient on a Windows or Linux management station.

To complete the Storage Manager 2 software installation, perform the following tasks. Each of these tasks is discussed in detail in the following sections.

1. Perform a discovery of storage subsystems.
2. Add devices, if necessary.
3. Set up alert notifications, if you want to.
4. Name the storage subsystems.
5. Download firmware and NVSRAM.
6. Create arrays and logical drives.
7. Configure the heterogeneous hosts.
8. Map logical drives to a partition.
9. Perform other storage subsystem tasks.

Starting the Storage Manager software and discovering storage subsystems

To start the Storage Manager software and discover storage subsystems, complete the following steps:

1. Choose one of the following commands:
   - **For Windows:** Click **Start → Programs → Storage Manager 2 Client**.
   - **For Linux:** Enter `/opt/IBM_DS3000/client/SMclient` (by default).

   The client software starts and the Enterprise Management window opens. Then, the Task Assistant window (shown in Figure 15 on page 69) and the Select Addition Method window (shown in Figure 13 on page 66) open on top of the Enterprise Management window.

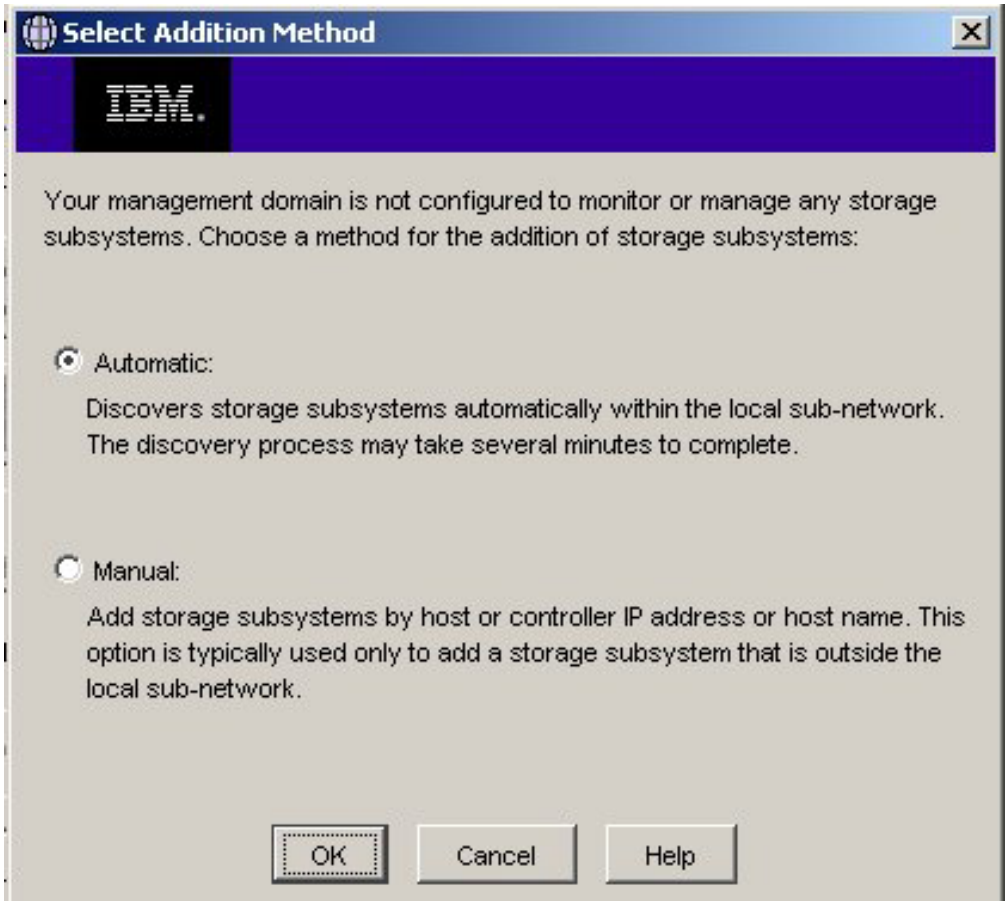

Figure 13. Select Addition Method window

2. Select **Automatic** to discover all hosts and storage subsystems that are attached to the local subnetwork. Select **Manual** to specify the IP address of a device that is attached to the local subnetwork.

   Note: The Enterprise Management window can take up to 1 minute to refresh after an initial automatic discovery.

3. Make sure that each host and storage subsystem is displayed in the Enterprise Manager window.

   If a host or storage subsystem is not displayed, complete the following tasks:

   - Check the hardware and hardware connections for possible problems (see the hardware documentation for specific procedures).
   - For more information about discovering storage subsystems, see the Enterprise Management online help.
   - If you are using the direct-management method, make sure that all hosts and storage subsystems are connected to the same subnet network. If you are using the host-agent method, make sure that the I/O connection between the host and the storage subsystem is made.
   - Make sure that all of the preparation steps for setting up the storage subsystem for a direct-managed system in Chapter 2, “Preparing for installation,” on page 21 are completed. If they are, use the Add Device option to add the IP addresses of the storage subsystem. Add both IP addresses of the controllers. Otherwise, a `partially-managed device` error message is displayed when you try to manage the storage subsystem.

- If you are using the host-agent management method, complete the following steps:
  a. Make sure that the SMagent is installed on the host.
  b. Make sure that you have a valid I/O connection from the storage subsystems to the host in which the SMagent is installed.
  c. Make sure that all of the preparation steps that are outlined in Chapter 2, “Preparing for installation,” on page 21 are complete. If they are, complete the following steps:
     1) Run the hot_add utility.
     2) Restart the SMagent, using the information in “Stopping and restarting the host-agent software” on page 99.
     3) On the Enterprise Management window, click the host and click **Tools → Rescan**.

Note: In certain situations, a storage subsystem might be duplicated in the device tree after an automatic discovery. You can remove a duplicate storage management icon from the device tree by using the Remove Device option in the Enterprise Management window.

4. Make sure that the status of each storage subsystem is Optimal. If a device shows a status of Unresponsive, right-click the device and select **Remove Device** to delete it from the management domain. Then, use the Add Device option to add it to the management domain again. For instructions for removing and adding devices, see the Enterprise Management window online help.

   Figure 14 shows the Enterprise Management window after an initial automatic discovery.

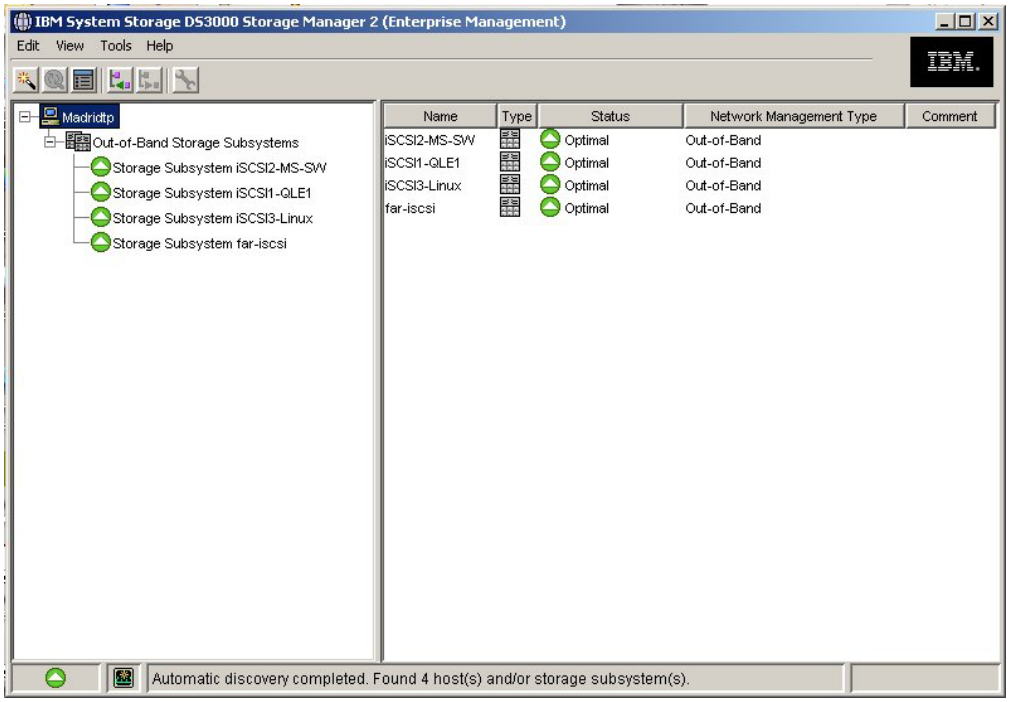

Figure 14. Enterprise Management window

Using the Task Assistant

When you start the Storage Manager software, the client software starts, and the Enterprise Management window opens. Then, the Task Assistant window opens and provides a central location from which you can choose to perform the most common tasks.

Note: The Task Assistant window opens automatically each time you open the Enterprise Management window, unless you select the **Don't show the task assistant at start-up again** check box at the bottom of the window.

The Task Assistant provides shortcuts to the following tasks:

- Adding storage subsystems
- Naming or renaming storage subsystems
- Configuring alerts
- Managing storage subsystems

Figure 15 on page 69 shows the Enterprise Management Window Task Assistant.

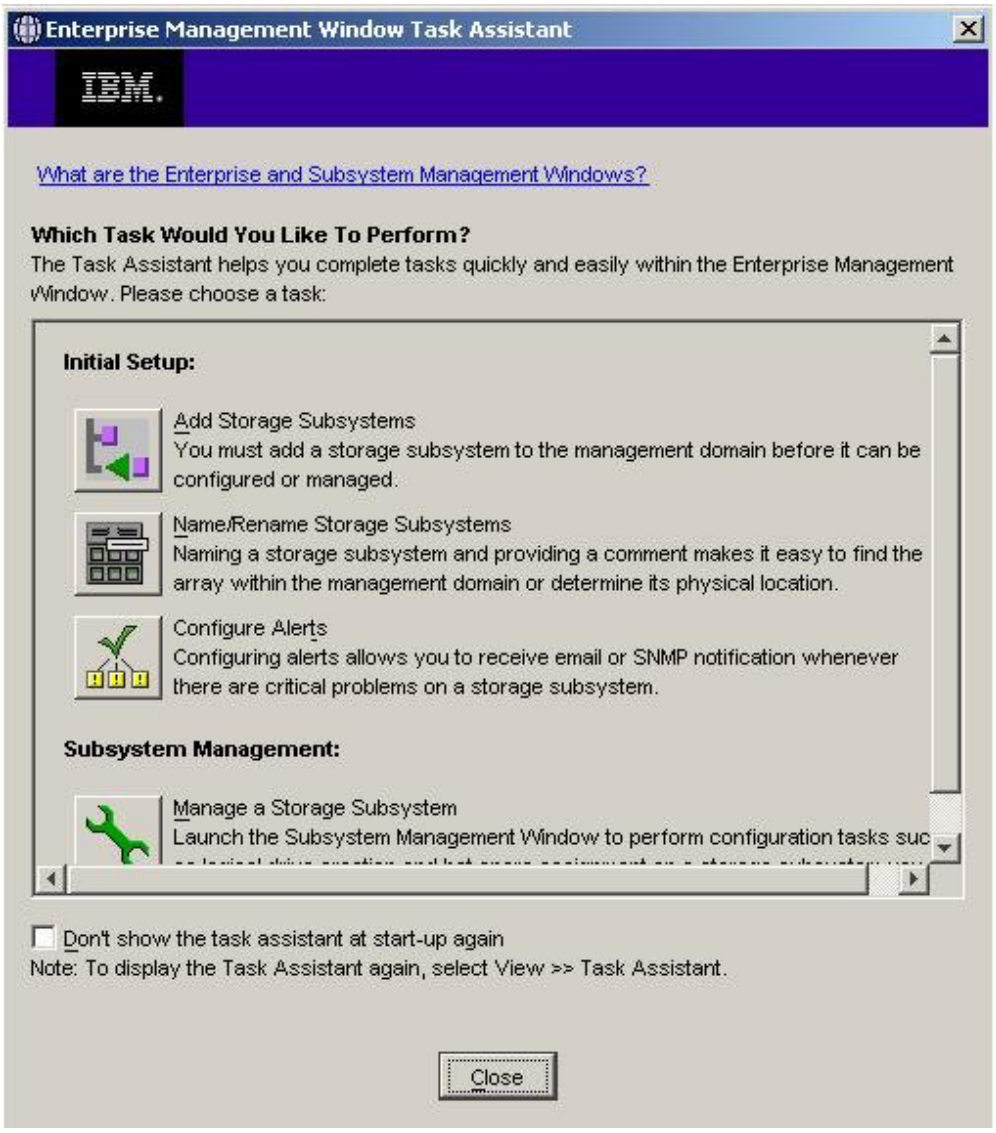

Figure 15. Enterprise Management Window Task Assistant

To open the Task Assistant after you have started the Storage Manager software, click **View → Task Assistant** from the Enterprise Management window, or on the toolbar, click the **Task Assistant** icon  .

Adding storage subsystems

To manually add more hosts or storage subsystems, from the Enterprise Management window, click **Edit → Add Storage Subsystem**. You can use this option to selectively manage a group of storage subsystems from a Storage Manager Client, and you can add devices that are to be managed and were not discovered during the initial discovery. For more information, see the Enterprise Management window online help.

Important:

- When you add an unidentified device, a window opens confirming that the device was successfully added and that you can manage the storage subsystem. Any

device that is listed in the unidentified device group will not be able to be managed until it is discovered correctly. Make sure that the connections are made, and try to add the device again.

- When you add new storage subsystems to the existing storage subsystems in a SAN that are managed through the host-agent software, you must stop and restart the host-agent service. When the host-agent service restarts, the new storage subsystem is detected. For more information, see “Stopping and restarting the host-agent software” on page 99. Then, go to the Enterprise Management window and click **Tools → Rescan** to add the new storage subsystems to the management domain.
- When you add new storage subsystems to existing storage subsystems that are managed through the direct (out-of-band) management method, be sure to specify the IP addresses for both controllers.

Naming storage subsystems

To name your storage subsystem, complete the following steps:

1. In the Enterprise Management window, select a storage subsystem, right-click the storage subsystem and select **Rename**. The Rename Storage Subsystem window opens.

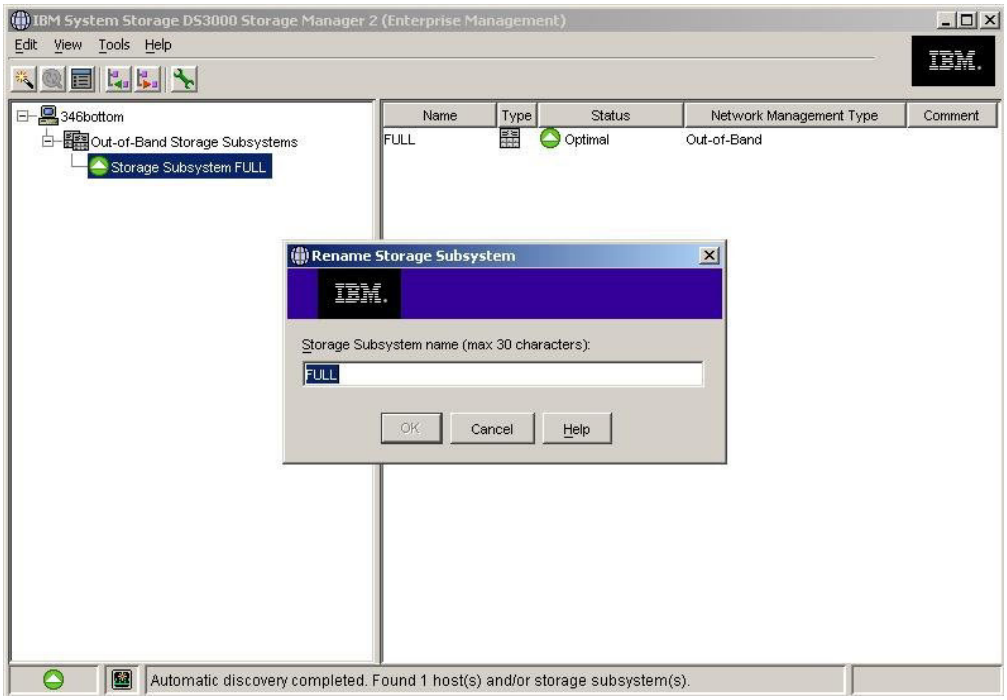

Figure 16. Rename Storage Subsystem window

2. Type the name of the storage subsystem (see Table 12 on page 105). Then, click **OK**. A warning message is displayed stating that changing the storage subsystem name can cause host applications to lose access to the storage subsystem. Click **Yes** to continue or **No** to cancel naming the storage subsystem.
3. Repeat this procedure for each unnamed storage subsystem. For more information, see the topic about renaming storage subsystems in the Subsystem Management window online help.

Configuring alerts

After you add devices to the management domain, you can set up alert notifications to report critical events on the storage subsystems. The following alert-notification options are available:

- Notification to a designated network management station (NMS) through Simple Network Management Protocol (SNMP) traps
- Notification to designated e-mail addresses

Note: You can monitor storage subsystems only within the management domain. If you do not install the Event Monitor service, the Enterprise Management window must remain open. If you close the window, you will not receive any alert notifications from the managed storage subsystems. For more information, see the Enterprise Management window online help.

To set up alert notification, from the Enterprise Management window, click **Edit → Configure Alerts**.

To set up alert notification to a network management station (NMS) by using SNMP traps, complete the following steps:

1. Insert the *IBM System Storage DS3000 Support* CD into the CD drive on an NMS. You must set up the designated management station only once.
2. Copy the SM2.MIB file from the SM2MIB directory to the NMS.
3. Follow the steps that are required by your NMS to compile the management information base (MIB) file. For more information, contact your network administrator or see the documentation that comes with your storage-management software.

The Initial Setup Tasks window

From the Subsystem Management window, you can open the Initial Setup Tasks window, which contains links to the following tasks:

- Locating the storage subsystem
- Renaming the storage subsystem
- Setting the storage subsystem password
- Configuring host access
- Managing iSCSI settings (DS3300 only)
- Configuring the storage subsystem

To open the Initial Setup Tasks window, complete the following steps:

1. In the Enterprise Management window, double-click the storage subsystem for which you want to perform the setup tasks. The Subsystem Management window opens.
2. Click the **Summary** tab.

3. On the **Summary** page, click **Perform Initial Setup Tasks**. The Initial Setup Tasks window opens, as shown in Figure 17.

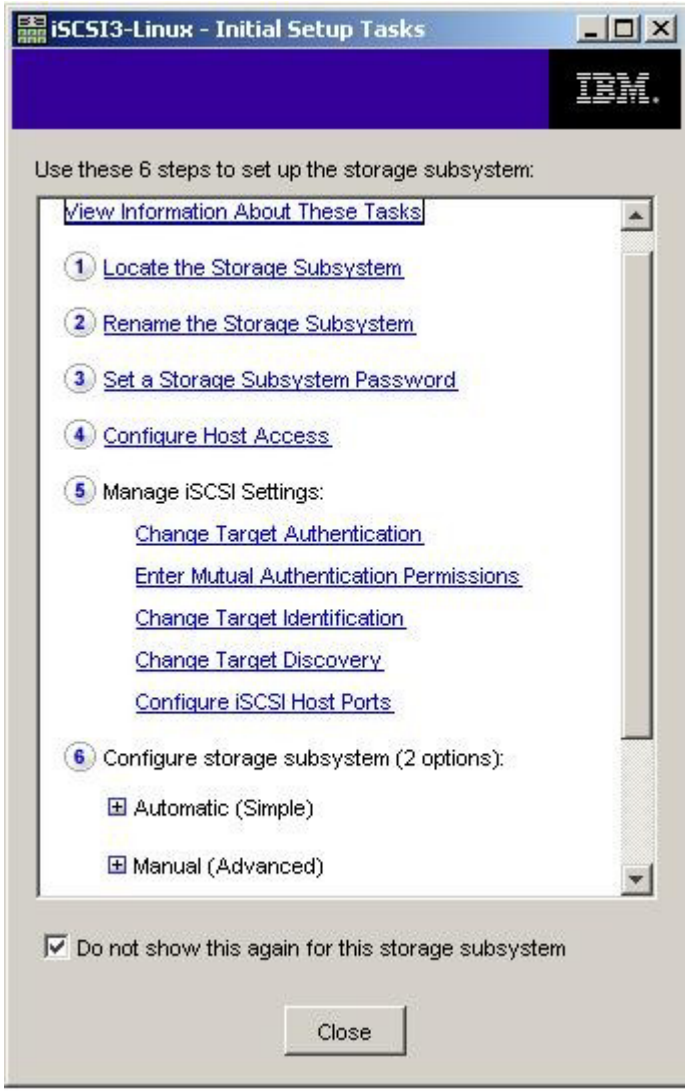

Figure 17. Initial Setup Tasks window in the Subsystem Management window

Note: The Initial Setup Tasks window opens automatically each time you open the Subsystem Management window, unless you select the **Do not show this again for this storage subsystem** check box at the bottom of the window.

Creating a storage subsystem profile

Important: Create a storage subsystem profile and save it in a safe place whenever you modify the arrays and logical drives in the storage subsystem. This profile contains detailed controller information, including logical and physical disk configuration information, that you can use to help recover the configuration in the event of a failure. Do not save the profile in the logical drives that are created in the DS3000 storage subsystem whose profile was collected and saved.

To save the storage subsystem profile, complete the following steps:

1. On the Subsystem Management window, click **Summary → Storage Subsystem Profile**. The Storage Subsystem Profile window opens.
2. Click **Save As**.
3. Select the sections that you want to save, and provide the file name in which to save the Profile.

You can also click **Support → Gather Support Information**, as shown in Figure 18, to collect the inventory, status, diagnostic, and performance data from the storage subsystem and save them to a single compressed file.

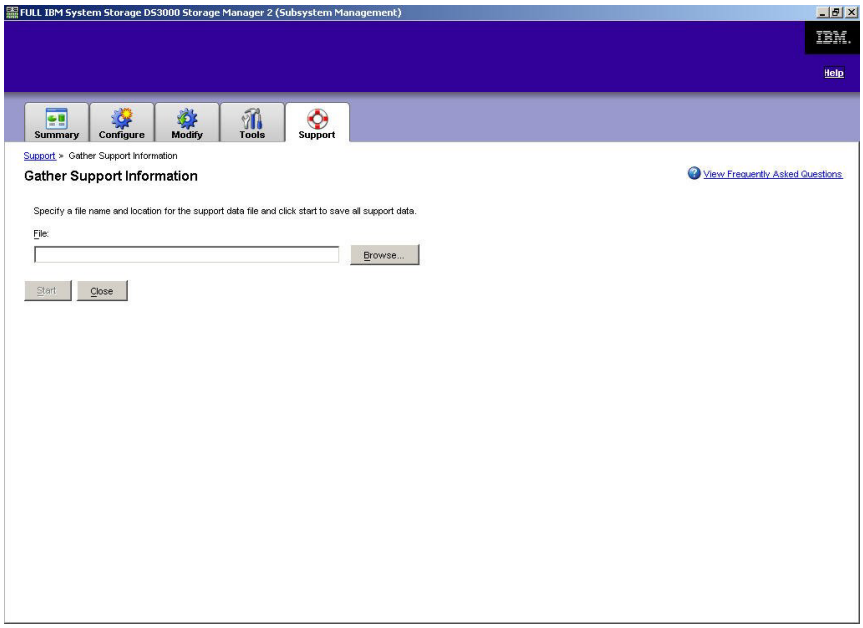

Figure 18. Gather Support Information window

Configuring host access

Before you use the logical drives in a host server, you must define and configure a host for access.

To configure host access, complete the following steps:

1. Click the **Configure** tab in the Subsystem Management window. Choose one of the following options:
   - To configure host access automatically, click **Configure Host Access (Automatic)** and follow the wizard instructions. After you have completed the instructions in the wizard, you are finished with this procedure.

     Note: To detect hosts automatically, the Storage Manager 2 Agent service must be running. Make sure that SMagent is installed before you proceed.
   - To configure host access manually, click **Configure Host Access (Manual)** and continue to step 2.
2. When the Configure Host Access (Manual) wizard starts, specify a host name and host type, and then click **Next**.

   Note: Before you use the logical drives in a host server, you must specify the correct host type. The host type determines how the storage subsystem

controllers will work with each operating system on the hosts to which the controllers are connected. For the supported host types, see the Storage Manager software readme file.

3. When the **Specify HBA Host Ports** area is displayed, add the known or new host bus adapters in the **Selected HBA host port identifiers/aliases** field, and then click **Next**.
4. (Optional) When the **Specify Host Group** area is displayed, specify a host group that will share access with logical drives. When you specify a host group, you can create a new host group or select an existing host group that has already been defined. Select **No** or **Yes**, and then click **Next**.

Defining host groups

A *host group* is an entity in the Storage Partitioning topology that defines a logical collection of host servers that require shared access to one or more logical drives. You can grant individual hosts in a defined host group access to additional logical drives that are not shared by other nodes, but this requires an additional storage partition. You can make logical drive-to-LUN mappings to the host group or to an individual host in a host group.

Important: If you have purchased a Storage Partitioning premium feature, make sure that the premium feature is enabled. See the instructions for enabling premium features that came with your key, or contact your technical-support representative if you are unable to enable a premium feature.

Note: You can configure heterogeneous hosts when you define a host group. This enables hosts running different operating systems to access a single storage subsystem.

To define a host group, complete the following steps:

1. On the Subsystem Management window, click **Configure → Create Host Group** to start the Create Host Group wizard.
2. When the **Create Host Group** area is displayed, enter a name for the host group and add any available hosts to the host group.
3. Click **OK**.

   Note: To add hosts to the host group at this time, available hosts must already be configured for access. You can first create a host group without adding hosts and then add hosts later, using the Create Host Access (Manual) wizard. For more information, see “Configuring host access” on page 73.

Creating arrays and logical drives

A redundant array of independent disks (RAID) *array* is a set of hard disk drives that are logically grouped together.

A *logical drive* is a logical structure that is the basic structure that you create to store data on the storage subsystem. The operating system recognizes a logical drive as a single drive. Choose a RAID level to meet application needs for data availability and to maximize I/O performance.

The maximum number of drives that are supported in an array is 30. Each array can be divided into 1 through 256 logical drives.

To create arrays and logical drives, complete the following steps:

1. From The Enterprise Management window, double-click a storage subsystem to open a Subsystem Management window.
2. Click the **Configure** tab.
3. Click **Create Logical Drives**. The Create Logical Drives wizard starts and the Select Capacity Type window opens.

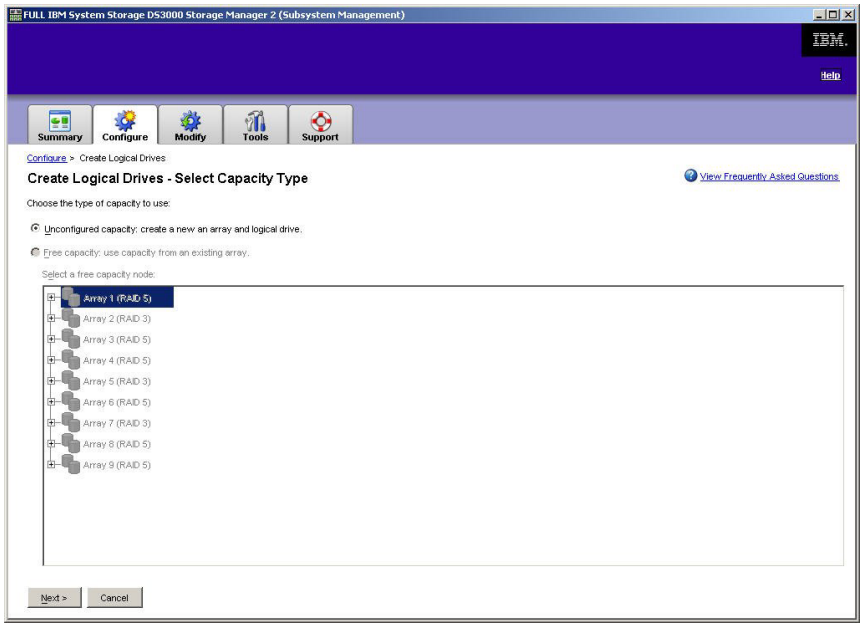

Figure 19. Create Logical Drives wizard window

4. Select **Unconfigured capacity** or **Free capacity**, and then click **Next**.

   Note: When you select **Free capacity**, you must first select the free capacity node from an existing array before you proceed with the wizard.

   If you select **Unconfigured capacity**, skip to step 10 on page 77.
5. From the **Select drive type** list, select **SAS** or **SATA**.

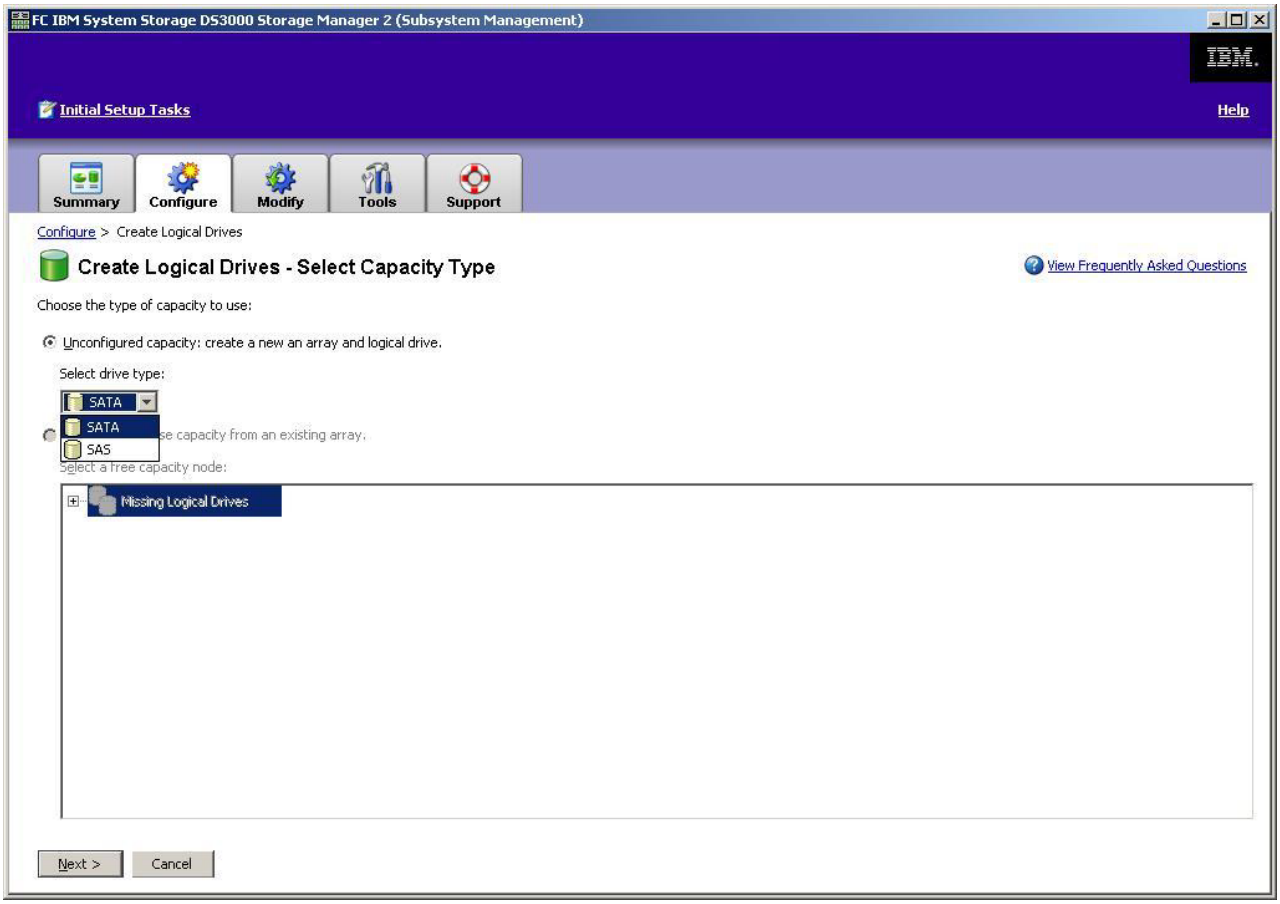

Figure 20. Selecting the capacity type

Note: You must create arrays by using drives that have the same disk type. You cannot mix both SATA and SAS drives within the same array.

6. When the **Drive Selection Choices** area is displayed, select either **Automatic** or **Manual** and click **Next**. If you select **Automatic**, continue to step 7. If you select **Manual**, skip to step 8.

   Note: Selecting **Automatic** is preferred for quick and easy configuration. This method enables you to choose from a list of automatically generated drive and capacity options. Selecting **Manual** gives advanced users a method for specifying drives to create a new array.

7. When the **Choose Configuration (Automatic Configuration)** area is displayed, select a RAID level and click **Finish**.

   Note: Depending on the selected RAID level, the automatic configuration configures all remaining unconfigured capacity that is currently available on the storage subsystem. Check the **Configuration summary** field for details about what will be configured.

8. When the **Manual Drive Selection** area is displayed, as shown in Figure 21 on page 77, select the RAID level. Select the drives from the **Unselected drives** area and click **Add** to move the drives to the **Selected drives** area. In the **Selected drives** area, click **Calculate Capacity**, and then click **Next**.

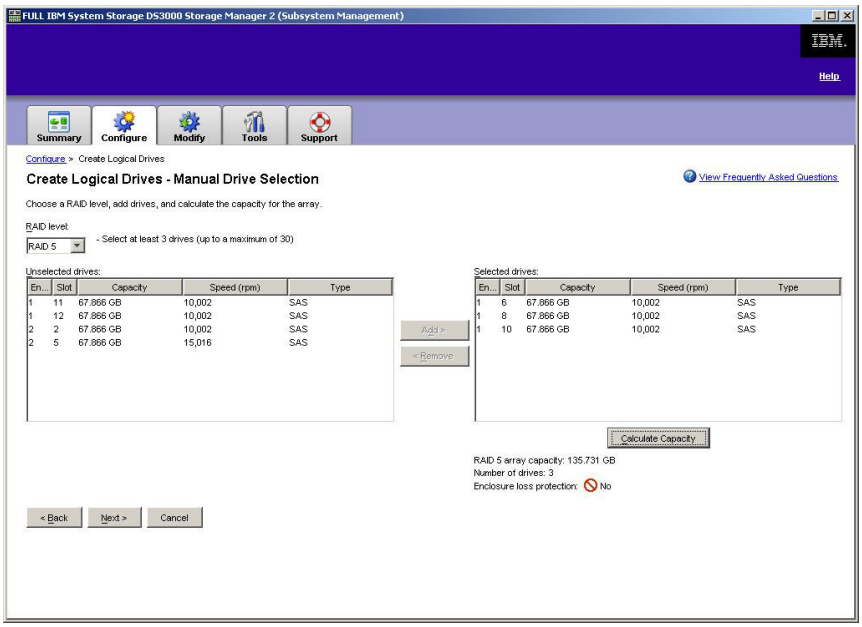

Figure 21. Manual drive selection area

9. When the **Specify Logical Drive** area is displayed, specify the capacity, name, and I/O characteristics of the logical drive, and click **Next**.
10. When the **Map Logical Drive To Host** area is displayed, select **Map now** to map a logical drive immediately, using the host that you defined in "Configuring host access" on page 73 or **Map later** to map a logical drive at a later time, and then click **Next**.

    Notes:

    a. If you did not configure hosts previously, a warning message is displayed. Read the message and click **OK**; then, continue with the Create Logical Drives wizard.

    b. To map the logical drive immediately, you must have previously configured a host or host group (be sure to assign a LUN number for your logical drive before you continue). If you select **Map later**, you can map the logical drive through the Create Host-to-Logical Drive Mappings wizard. For more information, see "Mapping LUNs to a partition."

Note: For cluster configurations, if you add or delete logical drives, you must make them known to both nodes A and B.

Mapping LUNs to a partition

Logical unit numbers (LUNs) are assigned to each logical drive when they are mapped to a partition.

To map LUNs to a new or existing partition, complete the following steps:

1. On the Subsystem Management window, click **Configure → Create Host-to-Logical Drive Mappings** to start the wizard.
2. When the **Select Host** area is displayed, select a host or host group and click **Next**.

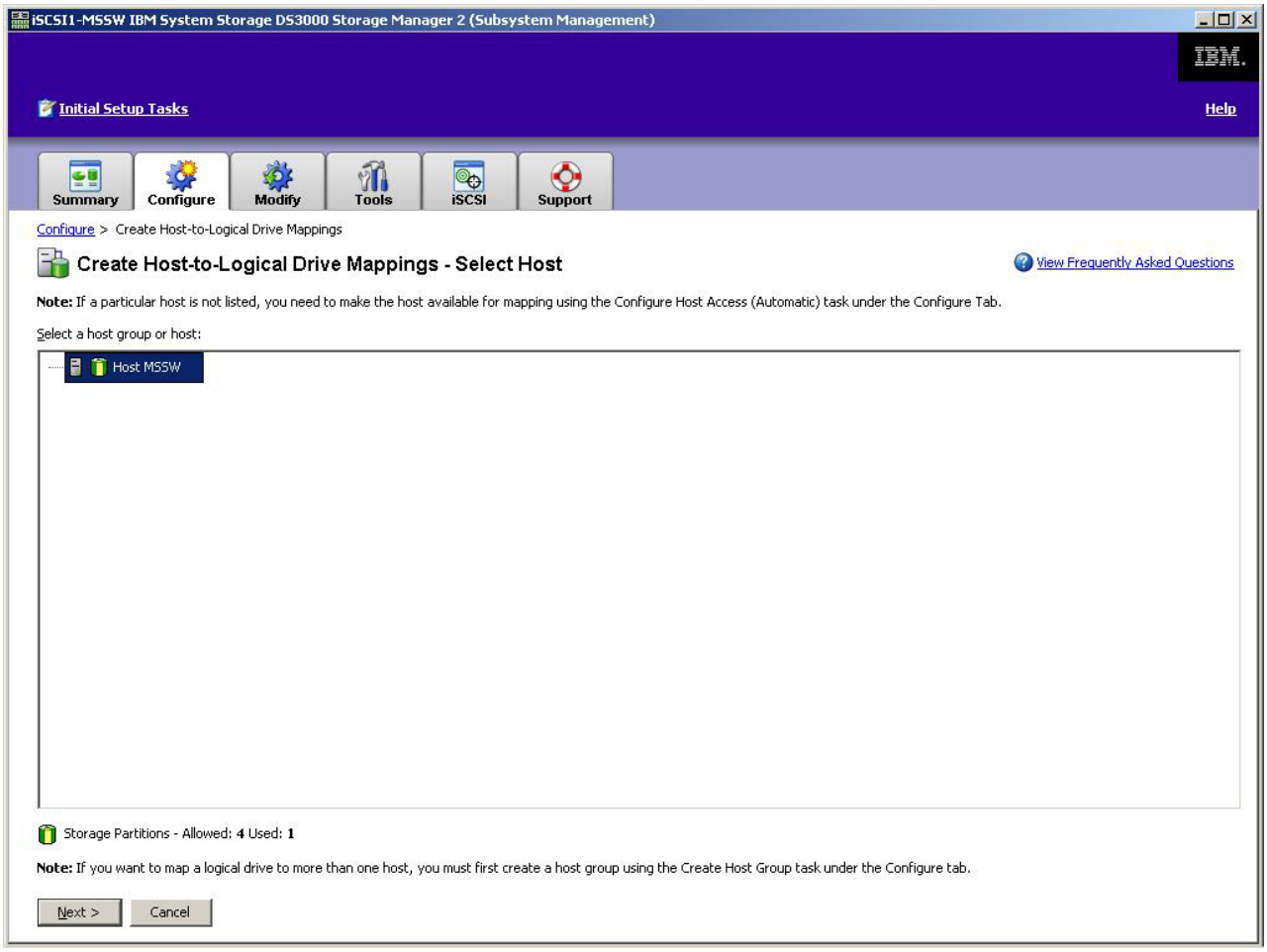

Figure 22. Create host area

3. When the **Select Logical Drives** area is displayed, select the logical drives that you want to map to the specified host, and click **Finish**.

Configuring hot-spare devices

You can assign available physical drives in the storage subsystem as hot-spare drives to keep data available. A hot spare is a drive that contains no data and that acts as a standby in case a drive fails in an array. If the drive in an array fails, the controllers automatically use a hot-spare drive to replace the failed drive while the storage subsystem is operating. The controller uses redundancy data to automatically reconstruct the data from the failed drive to the replacement (hot-spare) drive. This is called *reconstruction*.

The hot-spare drive adds another level of redundancy to the storage subsystem. If a drive fails in the storage subsystem, the hot-spare drive is automatically substituted without requiring a physical swap. If the hot-spare drive is available when a logical drive fails, the controller uses redundancy data to reconstruct the data from the failed logical drive to the hot-spare drive. When the failed drive is replaced or another drive is designated as a replacement, the data from the hot-spare drive is copied back to the replacement drive. This is called *copyback*.

To assign a hot-spare drive, open the Subsystem Management window, click the **Configure** tab, and select one of the following options:

- **Automatically assign drives**. If you select this option, hot spare drives are automatically created for the best hot spare coverage using the drives that are available.
- **Manually assign individual drives**. If you select this option, hot spare drives are created out of available drives that are manually selected from the Configure Hot Spares window.

If you choose to manually assign the hot-spare drives, select a drive with a capacity equal to or larger than the total capacity of the drive you want to cover with the hot spare. For maximum data protection, do not assign a drive as a hot-spare unless its capacity is equal to or greater than the capacity of the largest drive on the storage subsystem. Use only the largest capacity drives for hot-spare drives in mixed capacity hard disk drive configurations.

Replacing a hard disk drive

If a hard disk drive fails and a hot-spare drive is available, the hot spare begins a reconstruction process to temporarily replace the failed drive. With the configurable drive replacement policy, you can choose one of the following options:

- Replace the failed drive with a replacement drive. The replacement drive performs a copyback operation from the hot-spare drive and becomes part of the array.
- From the Replace Drive window (on the **Modify** tab), select the hot-spare drive that is currently part of the degraded array, to become a permanent member of the array.
- From the Replace Drive window (on the **Modify** tab), select another available drive in the storage enclosure to become designated as the replacement drive. This drive performs a copyback operation from the hot spare and becomes part of the array.

Note: The selection of a replacement drive cannot be completed until a hot-spare drive has completed its reconstruction process.

Managing iSCSI settings (DS3300 only)

Note: The **iSCSI** tab on the Subsystem Management window is available only for DS3300 storage subsystems.

On the Subsystem Management window, click the **iSCSI** tab. A window similar to the one in the following illustration opens.

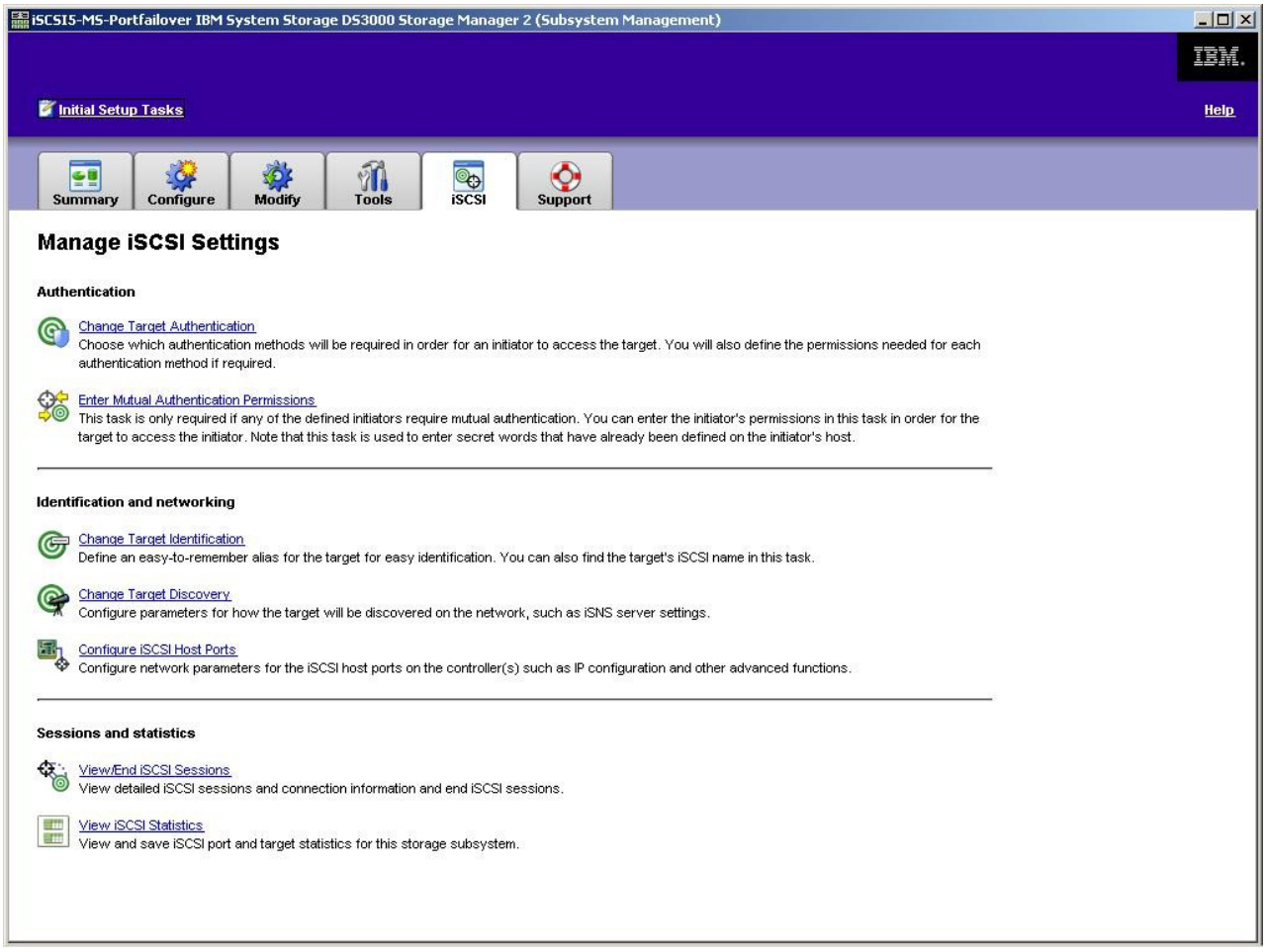

Figure 23. Manage iSCSI settings page

The following options are available from the **iSCSI** page:

- Change Target Authentication
- Enter Mutual Authentication Permissions
- Change Target Identification
- Change Target Discovery
- Configure iSCSI Host Ports
- View/End iSCSI Sessions
- View iSCSI Statistics

Changing target authentication

Select **Change Target Authentication** to specify the target challenge handshake authentication protocol (CHAP) secret that the initiator must use during the security negotiation phase of the iSCSI login. By default, **None** is selected. To change the selection, click **CHAP**, and then type the CHAP secret. You can select the option to generate a random secret if you want to. This enables 1-way CHAP.

Entering mutual authentication permissions

Before you select **Enter Mutual Authentication Permissions**, you must define a host port for the initiator and enable **Target Authentication**. After the host port is listed, select the host from the list and click **Chap Secret** to specify the secret that is passed to the initiator from the target to authenticate it. This enables Mutual CHAP (2-way).

Changing target identification

Select **Change Target Identification** to specify a target alias that is to be used during device discovery. You must provide a unique name for the target that consists of fewer than 30 characters.

Note: You will connect to the target by using the fully qualified IQN that is listed above the alias.

Changing target discovery

Select **Change Target Discovery** to perform device discovery by using the iSCSI simple naming service (iSNS). After you select this option, select the **Use iSNS Server** check box. You can also select whether the iSNS server is discovered using a DHCP server on your network, and you can manually specify an Internet Protocol version 4 (IPv4) or IPv6 address. When you click the **Advanced** tab, you can assign a different TCP/IP port for your iSNS server for additional security.

Note: To provide the required port login information for correct device discovery, all iSCSI ports must be able to communicate with the same iSNS server.

Configuring iSCSI host ports

Select **Configure iSCSI Host Ports** to configure all of the TCP/IP settings. You can choose to enable or disable IPv4 and IPv6 on all of the ports. You can also statically assign IP addresses or let them be discovered using DHCP. Under **Advanced IPv4 Settings**, you can assign VLAN Tags (802.1Q) or set the Ethernet Priority (802.1P). Under **Advanced Host Port Setting**, you can specify a unique iSCSI TCP/IP port for that target port. You can also enable Jumbo Frames from this option. The supported frame sizes are 1500 and 9000.

Viewing or ending an iSCSI session

Select **View/End iSCSI Sessions** to view all of the connected iSCSI sessions to the target. From this page, you can also close an existing session by forcing a target ASYNC logout of the initiator session.

Viewing iSCSI statistics

Select **View iSCSI Statistics** to view a list of all iSCSI session data, for example, the number of header digest errors, number of data digest errors, and successful protocol data unit counts. You can also set a baseline count after a corrective action to determine whether the problem is solved.

Determining firmware levels

There are two methods for determining the DS3000 storage subsystem, expansion unit, drive, and ESM firmware versions. Each method uses the Storage Manager Client that manages the DS3000 storage subsystem with the attached expansion unit.

Method 1

Open the Subsystem Management window and click the **Summary** tab. Select **Storage Subsystem Profile** in the **Hardware Components** area. When the Storage Subsystem Profile window opens, select one of the following tabs to view the firmware information.

Note: The Storage Subsystem Profile window contains all the profile information for the entire subsystem. Therefore, you might have to scroll through a large amount of data to find the information that you want.

Summary

- Firmware version (controller firmware)
- NVSRAM version

The following example shows the profile information on the Summary page.

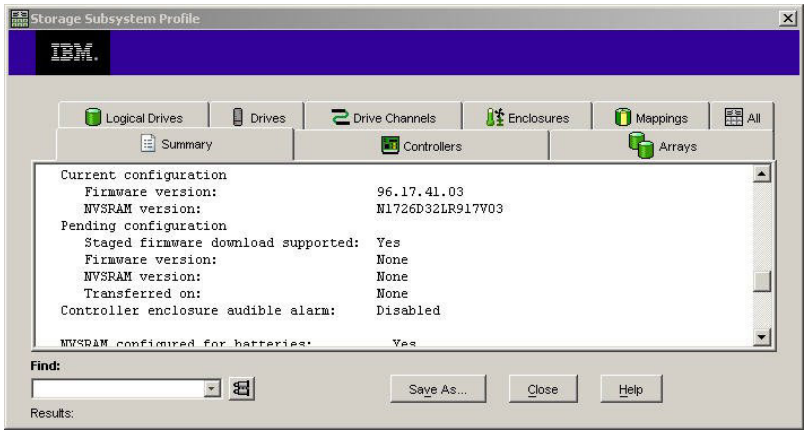

Figure 24. Example of profile information on the Summary page

Controller

- Firmware version
- Appware version (Appware is a reference to controller firmware)
- Bootware version (Bootware is a reference to controller firmware)
- NVSRAM version

The following example shows the profile information on the Controller page.

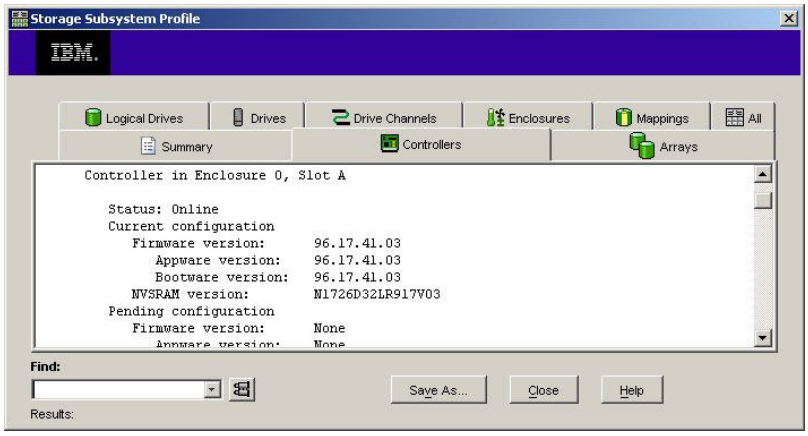

Figure 25. Example of profile information on the Controller page

Enclosures

- Firmware version

The following example shows the profile information on the Enclosures page.

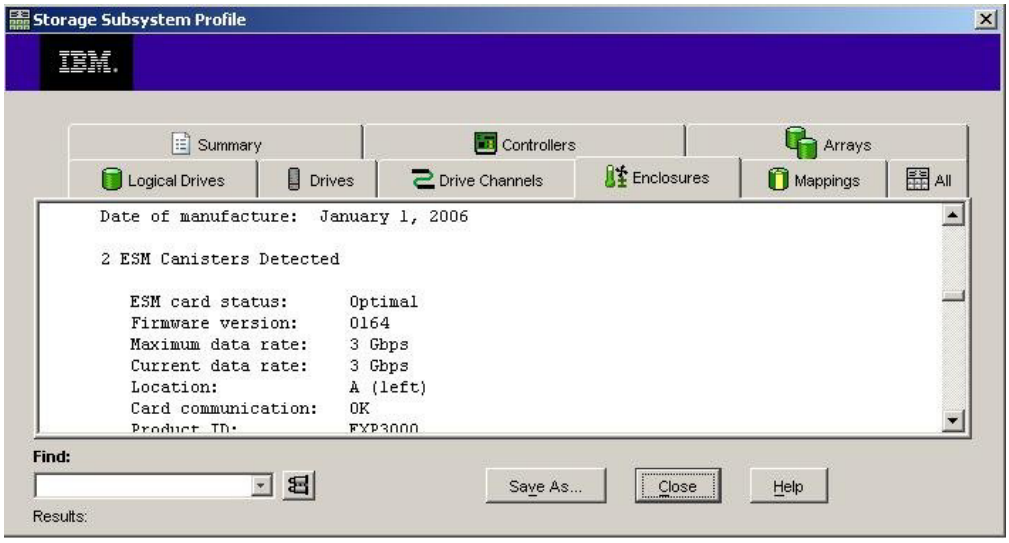

Figure 26. Example of profile information on the Enclosures page

Drives

- Firmware version (drive firmware)

The following example shows the profile information on the Drives page.

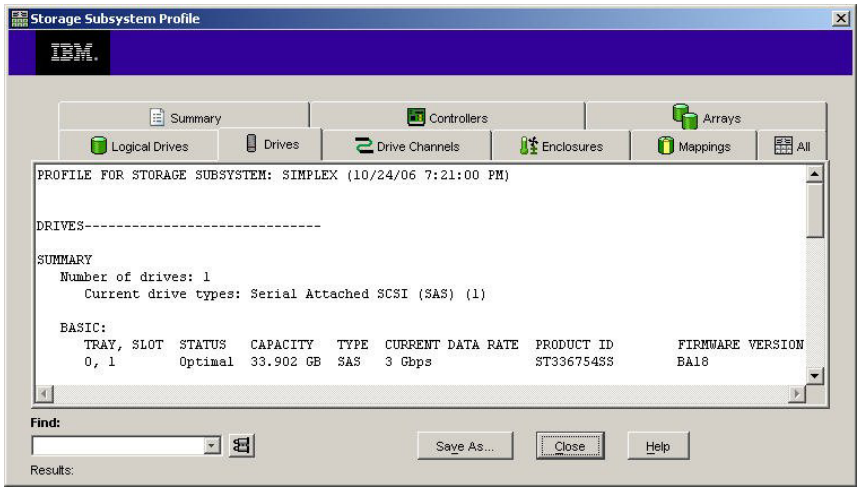

Figure 27. Example of profile information on the Drives page

Method 2

Open the Subsystem Management window and select **Download Firmware** on the Support page. Select one of the following options to view the firmware information.

Note: Use method 2 only to make sure that the firmware versions are correct. After you check the firmware versions, cancel or close the windows to avoid downloading firmware unintentionally.

Download controller firmware

- Firmware version (controller firmware)
- NVSRAM version

Download NVSRAM

- NVSRAM version

Download drive firmware

- Firmware version (drive firmware)

Download Environmental Services Monitor (ESM) firmware

- Enclosure firmware version

Downloading controller, NVSRAM, ESM, and hard disk drive firmware

Note: You can download the latest versions of DS3000 storage subsystem controller firmware, NVSRAM, EXP3000 ESM, and hard disk drive firmware at http://www.ibm.com/servers/storage/support/disk/.

Important:

1. IBM supports the download of controller firmware and controller NVSRAM with I/O (in a dual-controller configuration), which is sometimes referred to as *concurrent firmware download*. Before you proceed with concurrent firmware

download, see the readme file that is packaged with the firmware code or see your DS3000 Storage Manager host software for any restrictions to this support.

2. Stop all I/O activity while you download firmware and NVSRAM to a DS3000 storage subsystem with a single controller, because you will lose the connections between the host server and the DS3000 storage subsystem.

This section provides instructions for downloading DS3000 storage subsystem controller firmware and NVSRAM, EXP3000 ESM firmware, and drive firmware. Normally, the DS3000 storage subsystem firmware download sequence starts with controller firmware, followed by the NVSRAM and then the ESM firmware, and concludes with the hard disk drive firmware.

Downloading controller or NVSRAM firmware

To download the DS3000 storage subsystem controller firmware and NVSRAM, complete the following steps:

1. From the Enterprise Management window, open the Subsystem Management window by double-clicking a storage subsystem.
2. Click **Support → Download firmware → Download Controller Firmware**. The Download Controller Firmware window opens, as shown in Figure 28.

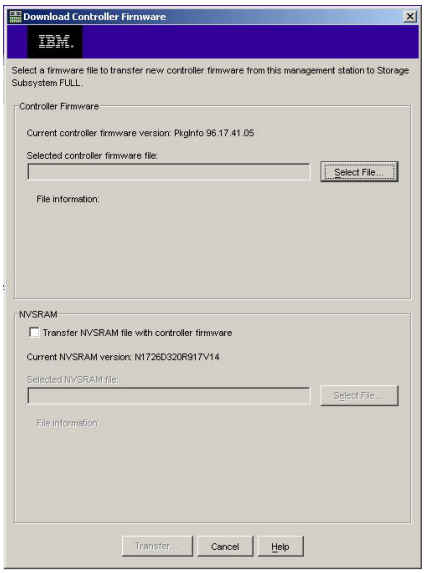

Figure 28. Download Controller Firmware window

3. To select the controller firmware file, click **Select File** next to the **Selected controller firmware file** field, and then browse to the file that you want to download.
4. To select the NVSRAM file, click **Select File** next to the **Selected NVSRAM file** field, and then browse to the file that you want to download.

   To transfer the NVSRAM file with the controller firmware, select the **Transfer NVSRAM file with controller firmware** check box.
5. Click **Transfer**.

Downloading ESM firmware

To download the ESM firmware, complete the following steps.

Note: Downloading ESM firmware must be performed with all I/O quiesced.

1. In the Subsystem Management window, click **Support → Download firmware → Download Environmental (ESM) Card Firmware**. The Download Environmental (ESM) Card Firmware window opens.

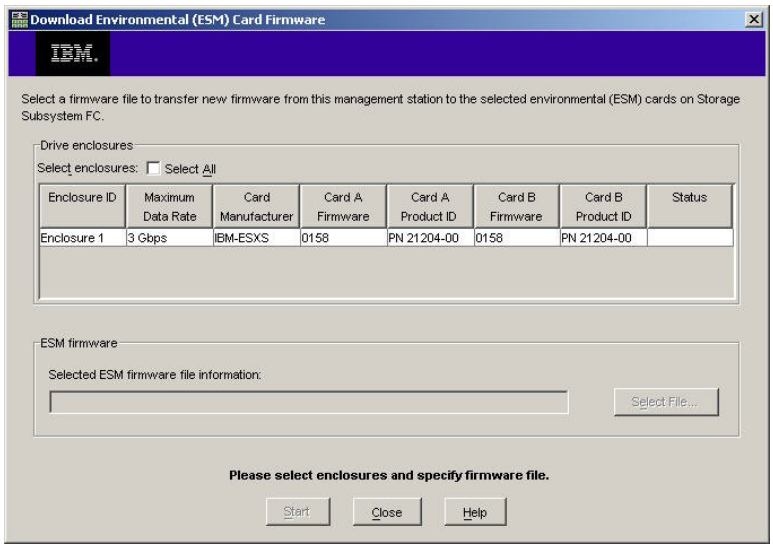

Figure 29. Download Environmental (ESM) Card Firmware window

2. Select the **Select All** check box to direct the download to all enclosures. You can also select one enclosure or combinations of enclosures by pressing the Ctrl key while you select the individual enclosures.
3. To select the ESM firmware file, click **Select File** next to the **Selected ESM firmware file information** field, and then browse to the file that you want to download.
4. Click **Start** to begin the ESM firmware download. A Confirm Download window opens.
5. Type yes and click **OK** to start the download process.
6. When the ESM firmware download for all selected enclosures is completed, click **Close**.

Automatic ESM firmware synchronization

When you install a new ESM in an existing storage expansion enclosure that is connected to a DS3000 storage subsystem that supports automatic ESM firmware synchronization, the firmware in the new ESM is automatically synchronized with the firmware in the existing ESM. This resolves any ESM firmware mismatch conditions automatically.

Note: Automatic ESM firmware synchronization can be performed only after an ESM firmware file is successfully downloaded to an ESM in the storage expansion enclosure.

To enable automatic ESM firmware synchronization, make sure that your system meets the following requirements:

- The Storage Manager Event Monitor is installed and running.
- The DS3000 storage subsystem is defined in the Storage Manager Client (SMclient) Enterprise Management window.

Downloading drive firmware

This section provides instructions for downloading DS3000 drive firmware. For more information, see the online help.

Important: Before you start the drive firmware download process, complete the following tasks:

- Stop all I/O activity before you download drive firmware to a DS3000 storage subsystem.
- Unmount the file systems on all logical drives that access the drives that you select for firmware upgrade.
- Complete a full backup of all data on the drives that you select for firmware upgrade.

To download the drive firmware, complete the following steps:

1. On the Enterprise Management window, open a subsystem management window by double-clicking a storage subsystem.
2. Click **Support → Download firmware → Download Drive Firmware**. The Download Drive Firmware windows opens.

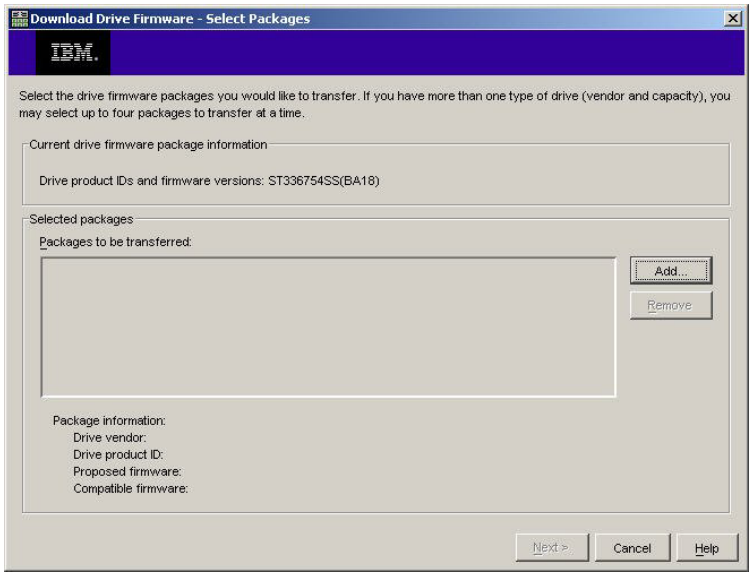

Figure 30. Download Drive Firmware window

3. Click **Add** to locate the server directory that contains the firmware that you want to download.
4. Select the firmware file that you want to download and click **OK**. The file is then listed in the **Selected Packages** area.
5. Select the firmware file for any additional drive types that you want to download, and click **OK**. The additional files are then listed in the **Selected Packages** area. A maximum total of four drive types are possible.

6. Click **Add** to repeat step 5 on page 87 until you have selected each firmware file that you want to download.
7. When you have finished specifying the firmware packages for download, click **Next**.
8. In the Select Drive window (shown in Figure 31), click the **Compatible Drives** tab. The Compatible Drives page contains a list of the drives that are compatible with the firmware package types that you selected. Press and hold the Ctrl key while you use the mouse to select multiple drives individually, or press and hold the Shift key while you use the mouse to select multiple drives that are listed in series. The compatible firmware that you selected in steps 4 on page 87 and 5 on page 87 are downloaded to the drives that you select.

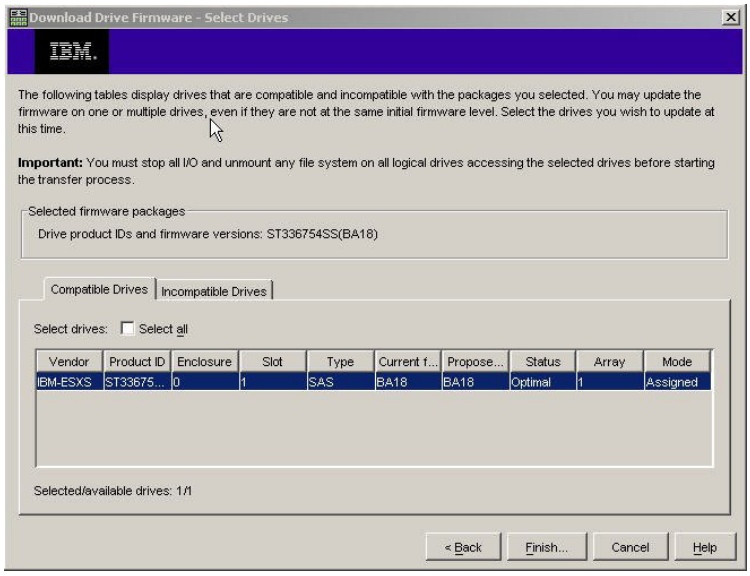

Figure 31. Select Drive window

Note: The firmware packages that you select to download should be listed on the Compatible Drives page. If the product ID for your drive matches the firmware type but it is not listed as compatible on the page, contact your technical-support representative for additional instructions.

9. Click **Finish** to initiate the download of the drive firmware to each compatible drive that you selected in step 8.
10. When the Download Drive Firmware warning window opens and the message `Do you want to continue?` is displayed, type `yes` and click **OK** to start the drive firmware download. The Download Progress window opens, as shown in Figure 32 on page 89. Do not intervene until the download process is completed.

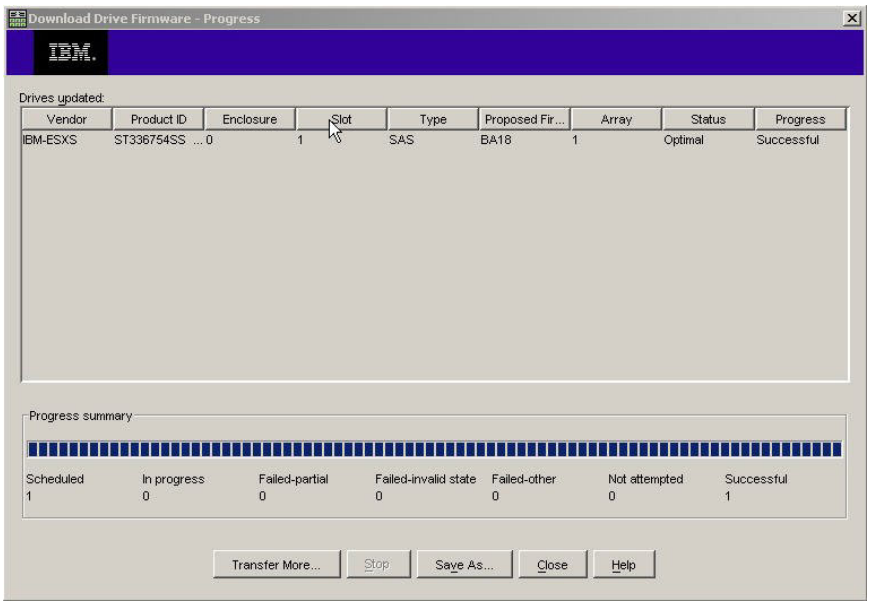

Figure 32. Download Progress window

Every drive that is scheduled for firmware download is designated as `in progress` until it is designated as `successful` or `failed`.

11. If the download for a drive fails, complete the following steps:
    a. Click the **Save as** button to save the error log.
    b. On the Subsystem Management window, click **Support → View Event Log** and complete the following steps to save the storage subsystem event log before you contact your technical-support representative:
        1) Click **Select all**.
        2) Click **Save as**.
        3) Provide a file name to which to save the log.

    When the **Close** button is active, the drive firmware download process is completed.
12. Click **Close**.

Array import and export functions

The array import and export functions enable the transfer of configurations between DS3000 storage subsystems.

Important: The array import and export functions are available for only DS3000 storage subsystems that are running controller firmware version 07.35 or later. This function does not work with storage subsystems or arrays that are using controller firmware version 06.xx.

Exporting an array

To export an array, complete the following steps:

1. In the Subsystem Management window, click the **Advanced Support** tab.
2. Click **Export Array**. The Export Array wizard opens. The wizard helps you prepare an array for export from one storage subsystem to another storage subsystem.

Important: Before you start the export function, you must stop all I/O to the array that you are exporting.

3. Select the array that you want to export and click **Next**.

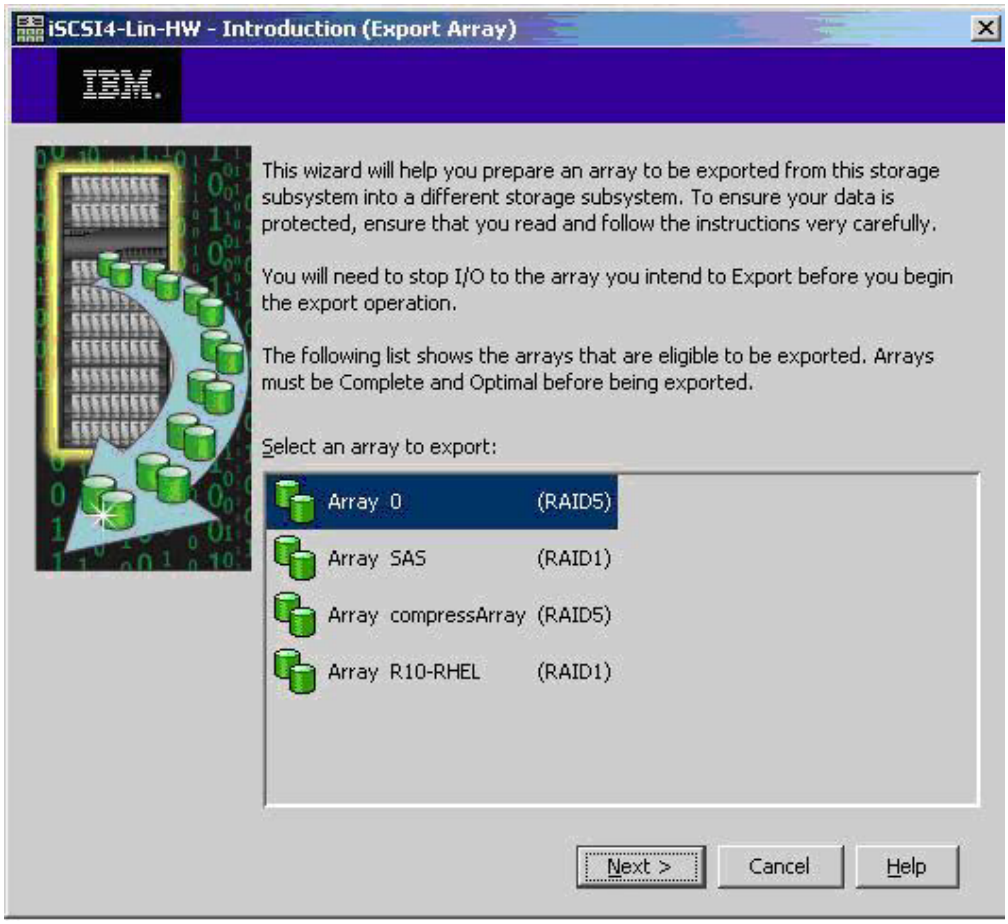

Figure 33. Selecting an array in the Export Array wizard

4. The Preparation Checklist window opens and provides a list of procedures that you must complete before you can export an array.

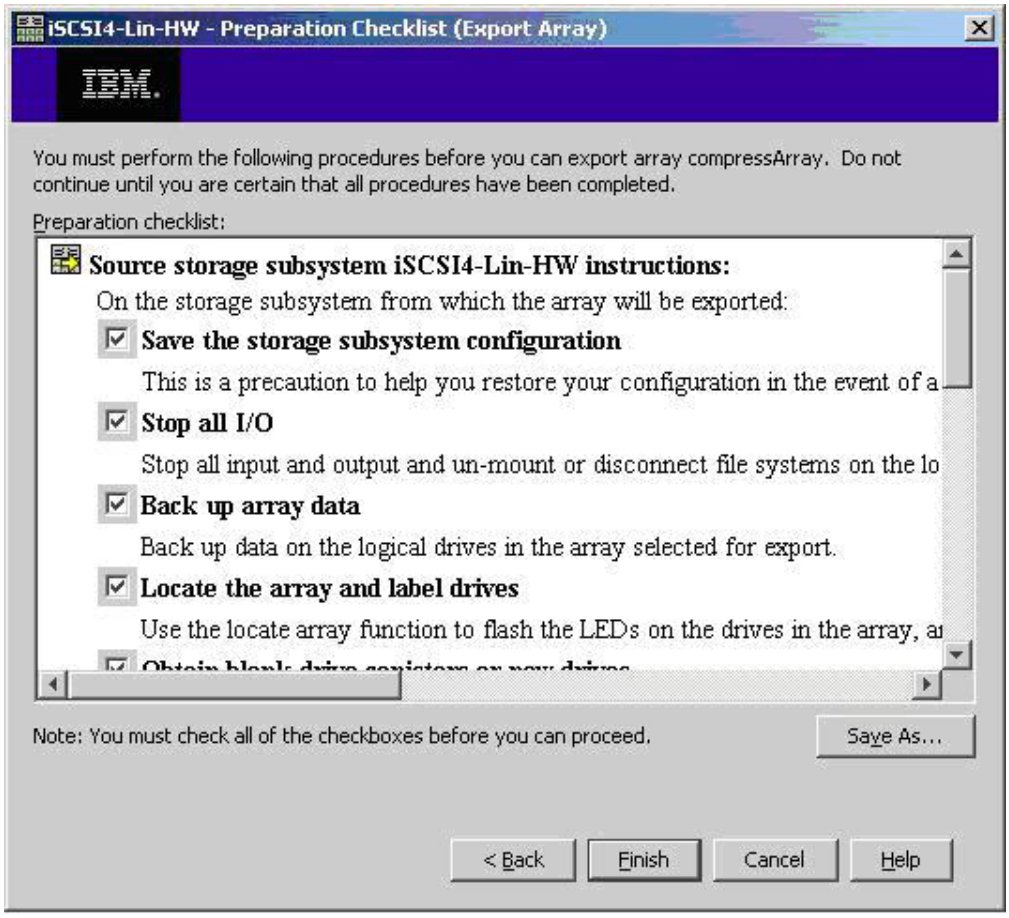

Figure 34. The Export Array Preparation Checklist window

5. After you complete the preparation checklist, click **Finish**.
6. In the Confirm Export window, type yes to begin the import operation process, and then click **OK**.
7. When the export operation is completed, you can remove the hard disk drives from the storage subsystem.

Importing an array

To import an array, complete the following steps:

1. Insert the hard disk drives that are associated with the exported array in the storage subsystem.
2. In the Subsystem Management window, click the **Advanced Support** tab.

3. Click **Import Array**. The Import Report window opens and shows the details of the array that you are importing.

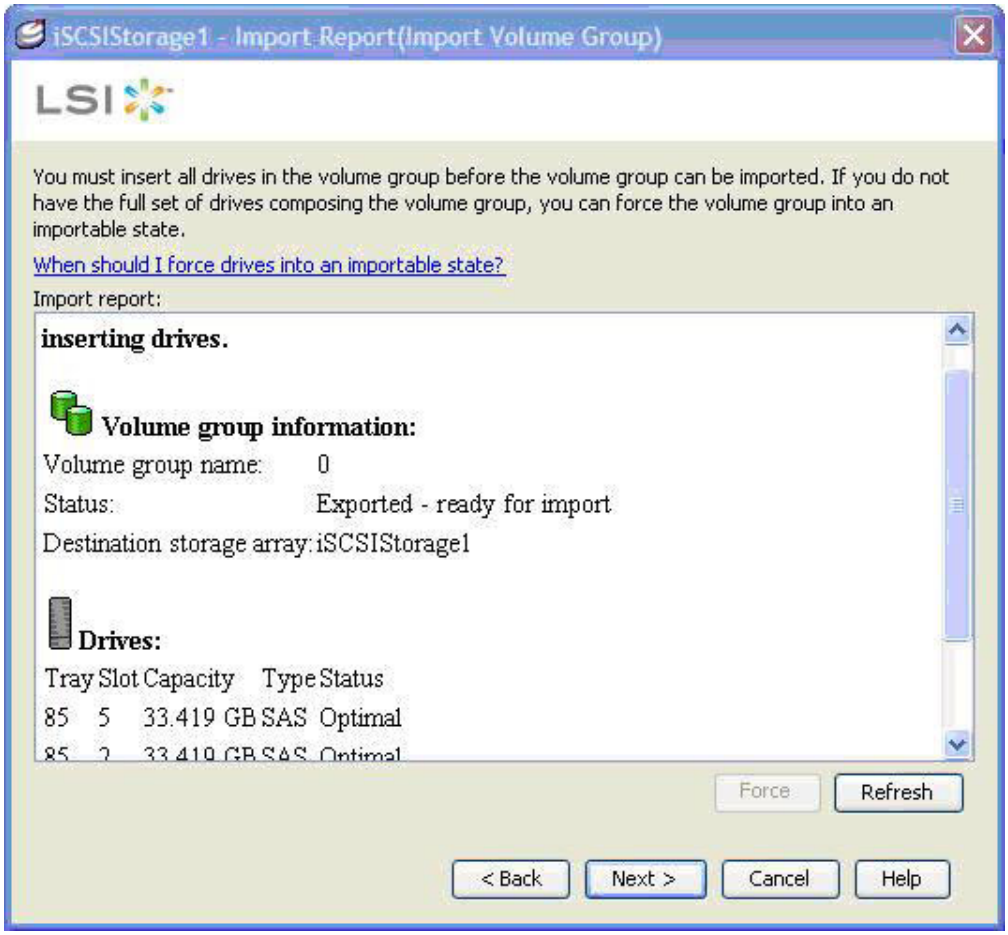

Figure 35. Import Report window

4. If the information in the report is correct, type yes in the Confirm Import window, and then click **OK** to begin the import operation process.

Performing other storage-subsystem management tasks

The following list describes other storage-subsystem management tasks that you can perform. You can perform the following tasks from the Subsystem Management window.

- Create hot spares (**Configure → Configure Hot Spares**)
- Automatically create logical drives and hot spares (**Configure → Automatic Configuration**)
- Edit host topology configurations for the subsystem (**Modify → Edit Topology**)
- Enter or change a storage subsystem password (**Tools → Set or Change Password**)
- View or change media scan settings (**Tools → Change Media Scan Settings**)
- Locate a storage subsystem or its components (**Tools → Locate**)
- View or enable premium features (**Tools → View/Enable Premium Features**)
- Change enclosure identification numbers for a storage subsystem (**Tools → Change Enclosure ID Numbers**)

- Synchronize controller clocks (**Tools → Synchronize Controller Clocks**)
- Change the network configuration (**Tools → Change Network Configuration**)
- Reset the battery age (**Tools → Reset Battery Age**)
- Inherit system settings from the operating system (**Tools → Inherit System Settings**)
- View the major event log (**Support → View Event Log**)
- Save all storage subsystem data (**Support → Gather Support Information**)
- Place controller online or offline (**Support → Manage Controllers**)

For more information about these and other storage-subsystem management tasks, see the applicable topics in the Subsystem Management online help.

For advanced users: You can perform other storage-subsystem management tasks from the Enterprise Management window by clicking **Tools → Script Editor**. For more information, see the Enterprise Management window online help.

Note: If there is a problem with the storage subsystem, a Needs Attention status icon is displayed in the Enterprise Management window next to the storage subsystem. In the Subsystem Management window, a Storage Subsystem Needs Attention link is displayed in the status area of the Summary page. You can click the link to open the Recovery Guru. You can also open the Recovery Guru by clicking **Support → Recover from Failure** in the Subsystem Management window.

Best practices guidelines for the DS3300

For the best performance of the Storage Manager software and the DS3300 , follow the guidelines in the following sections.

Microsoft iSCSI Software Initiator considerations

The native MPIO that is provided with the Microsoft iSCSI Software Initiator (version 2.03 or later) is not supported with the DS3300. You must use the DSM that is provided with the Storage Manager software to make sure that failover and I/O access are correct. If the native MPIO from the Microsoft iSCSI Software Initiator is used, it causes unwanted effects.

iSNS best practices

There are many considerations for using an iSNS server correctly. Make sure that you correctly assign your iSNS server address that is provided during the DHCP lease discovery of your initiator or target. This enables ease of discovery when you use software initiator-based solutions. If you are unable to do this and must manually assign the iSNS server to your software or hardware initiators, you should make sure that all ports for both the DS3300 target and the iSCSI initiator are in the same network segment (or make sure that the routing between the separate network segments is correct). If you do not do this, you will be unable to discover all ports during the iSCSI discovery process, and you might not be able to correctly perform a controller or path failover.

Using DHCP

Using DHCP for the target portals is not recommended. If you use DHCP, you should assign DHCP reservations so that leases are maintained consistently across

restarts of the DS3300 storage subsystem. If static IP reservations are not provided, the initiator ports can lose communication to the DS3300 controller and might not be able to reconnect to the device.

Using supported hardware initiators

As of the date of this document, only the following hardware initiators are supported:

- IBM iSCSI Server TX Adapter
- IBM iSCSI Server SX Adapter
- QLogic iSCSI Single-Port PCIe HBA for IBM System x
- QLogic iSCSI Dual-Port PCIe HBA for IBM System x

All of the hardware initiators that are supported use the same base firmware code and the SANsurfer management application. Before you install and configure these adapters, make sure that you have installed the latest management application and the latest firmware code. After you confirm this, configure each adapter one at a time.

To make sure that failovers are performed correctly, connect each adapter by using one of the following two basic configurations:

- If you have a simple configuration in which all adapters and target ports are in the same network segment, each adapter should be able to log in to any target port.
- If you have a complex configuration, each adapter is allowed a single path to each controller device.

To log in correctly to all available target ports from the hardware initiator, complete the following steps.

Note: Failure to perform the steps in the following procedure might result in path failover inconsistencies and incorrect operation of the DS3300.

1. Start the SANsurfer management utility.
2. Connect to the system that is running the qlremote agent.
3. Select the adapter that you want to configure.
4. Select Port 0 or Port 1 for the adapter.
5. Click **Target Settings**.
6. Click the plus sign (+) in the far right of the window.
7. Type either the IPv4 or IPv6 address of the target port to which you want to connect.
8. Click **OK**.
9. Select **Config Parameters**.
10. Scroll until you see **ISID**.
11. For connection 0, the last character that is listed should be 0. For connection 1, it should be 1, for connection 2, it should be 2, and so on.
12. Repeat steps 6 through 11 for each connection to the target that you want to create.
13. After all of the sessions are connected, select **Save Target Settings**.

If you are using the QLogic iSCSI Single-Port or Dual-Port PCIe HBA for IBM System x to support IPv6, you should allow the host bus adapter firmware to assign the local link address.

Using IPv6

The DS3300 supports the Internet Protocol version 6 (IPv6) TCP\IP. Note that only the final four octets can be configured if you are manually assigning the local link address. The leading four octets are fe80:0:0:0. The full IPv6 address is required when you are attempting to connect to the target from an initiator. If you do not provide the full IPv6 address, the initiator might fail to be connected.

Network settings

Using the DS3300 in a complex network topology introduces many challenges. If possible, try to isolate the iSCSI traffic to a dedicated network. If this is not possible, follow these suggestions:

- If you are using a hardware-based initiator, the Keep Alive timeout should be 120 seconds. To set the Keep Alive timeout, complete the following steps:
  1. Start the SANsurfer Management Utility and connect to the server.
  2. Select the adapter and the adapter port that is to be configured.
  3. Select the port options and firmware.

     The default connection timeout is 60 seconds. This setting is correct for simple network topologies; however, if a network convergence occurs and you are not using Fast Spanning Tree and separate spanning tree domains, in a more complex configuration, you might encounter I/O timeouts.
- If you are using a Linux software initiator to connect to the DS3300, modify the ConnFailTimeout to account for the spanning tree issue that is described in step 3. The ConnFailTimeout value should be set to 120 seconds.

Operating system consideration

For the best performance, do not enable Data and Header Digest when using the embedded software initiators with the Red Hat Enterprise Linux 4 and SUSE Linux Enterprise Server 9 operating systems. If these functions are enabled, you will see degraded performance and in the case of multiple hosts accessing the same DS3300 storage subsystem, you might see that a path is marked incorrectly as having failed.

SATA disk drive best practices guidelines

If you use a stripe size of 8 KB, you cannot perform a format of a Linux ext2 file system on a logical drive configured with SATA drives. For the best performance, use a stripe size of 32 KB or larger when using SATA disk drives.

Fibre Channel best practices guidelines

If you install your Linux host with the QLogic host bus adapter installed in the host, the default device driver provided with the distribution is installed. The device drivers that are installed by the Linux installation have HBA failover support enabled. If these device drivers are used with the RDAC multipath support software, it might prevent RDAC from discovering all the available controller paths. You must install the most current HBA device drivers that are provided for your solution and make sure that the ramdisk image is remade with the most current HBA device drivers before you install the MPP failover driver. Failure to do so results in incorrect controller and path failover.

If you use the Emulex 4 GB Host Bus Adapter with Novell NetWare 6.5, you must add the following parameter to the driver load line:

```
N_TIMEOUT=0
```

Storage Manager 2 Enterprise Manager view and Subsystem Management view best practices guidelines

Consider the following information before you use the Storage Manager 2 Enterprise Management view and Application Management view:

- The current command to gather performance statistics (save storagesubystem performancestats=filename.xls;) does not gather any valid data. All of the values are zero (0). As of the date of this document, there is no workaround available.
- To create a logical drive using the smcli or Enterprise Manager script editor you must make nsure that the syntax of the command is correct. When you specify a logical drive size, the correct syntax is:

  ```
  create logicalDrive array[array_number] capacity=size_of_logical_drive TB/GB/MB;
  ```

  Note: There must be a space before *TB/GB/MB*; otherwise, the command does not work.
- The Storage Manager 2 Application Management view is limited to creating a maximum of 64 FlashCopies and 128 VolumeCopies. However, using the Storage Manager command-line interface enables a maximum of 128 FlashCopies and 255 VolumeCopies to be created.
- If you are updating a DS3000 storage subsystem, the first controller firmware download might fail. If this occurs, start the firmware download a second time and verify that the firmware is successfully downloaded. If the firmware download fails again, contact your IBM technical-support representative.
- To expand a logical drive using the smcli or Enterprise Manager script editor you must make nsure that the syntax of the command is correct. When you specify a logical drive size, the correct syntax is:

  ```
  set logicalDrive[logical_drive_name]
  addCapacity=size_to_increase_logical_drive_by TB/GB/MB;
  ```

  Note: There must be a space before *TB/GB/MB*; otherwise, the command does not work.
- When you map a FlashCopy logical drive to the NetWare host that the base logical drive was attached to, complete the following steps:
  1. Unmount the base logical drive from the host.
  2. Remove the storage partition containing the base logical drive.
  3. Disconnect the session from the client to the NetWare host.
  4. Map the FlashCopy logical drive to the host.
  5. Mount the FlashCopy volume and perform the required actions.
  6. Reconnect the client to the NetWare host.

  For the best performance and to avoid having to complete the previous steps, always mount the FlashCopy logical drive to a secondary host.
- If you are using a firewall between your management client and the host agent that is managing the controller or the controller TCP/IP address, make sure that you have created an exclusion for TCP/IP port 2463. This port is used by the Storage Manager software to communicate to the storage subsystem.
- When you perform an upgrade to the Storage Manager software from any previous version to Storage Manager version 06.70.xx.xx, you must perform a new discovery of all your storage subsystems again. The previous management domain is not maintained.

Chapter 9. Completing storage-management tasks for Windows hosts

This chapter provides information about how to add or delete logical drives, use the hot_add and SMdevices utilities, start and stop the host-agent software, and uninstall Storage Manager components in Windows operating system environments.

Adding or deleting logical drives

Use the following procedures to add or delete logical drives in a standard (noncluster) or cluster configuration.

Standard (noncluster) configuration for Windows Server 2003 and Windows Server 2008

Use the following procedures to create or delete logical drives in a standard configuration.

Creating logical drives

When you create logical drives with the Storage Manager software, you must add the new logical drives to the Windows Server 2003 or Windows Server 2008 operating system. Each logical drive is recognized by Windows Server as a single disk drive.

After you create logical drives, to add them to the Windows Server 2003 operating system, complete the following steps:

1. Right-click **My computer**; then, click **Manage → Device Manager → Disk Drives**.
2. Click **Actions → Scan for new or removed hardware**.

After you add the logical drives, run the SMdevices utility that is provided with the Storage Manager software. The SMdevices utility identifies logical drives by their associated operating-system device names. For more information, see “Using the SMdevices utility” on page 98 and the online help.

Note: For Windows Server 2008, before disk initialization, make sure that the disk device is Online. In the Computer Management window, click **Disk Management**. The disk devices are displayed in the bottom area of the window. Right-click the disk device that you want to put online and select **Online**.

Deleting logical drives

Attention: You must use the Disk Administrator to delete the cluster physical disk resources, delete operating-system partitions, and unassign drive letters before you delete logical drives or reset the configuration in the Storage Manager software. This action avoids damage to the registry information.

Before you delete logical drives with the Storage Manager, complete the following steps:

1. Use the Disk Administrator to delete any partitions and to unassign drive letters that are associated with the logical drives.
2. If possible, restart the system to remove the configuration information.

Cluster server configuration for Windows Server 2003 and Windows Server 2008

Use the following procedures to create or delete logical drives in a cluster server configuration.

Creating logical drives

To add logical drives in a Windows Server 2003 or Windows Server 2008 cluster server environment, complete the following steps:

1. Use the Storage Manager Client program to create arrays and logical drives and use storage partitioning to assign them to the applicable cluster host group.
2. Use the hot_add utility to add the new logical drives to the cluster node that currently owns the cluster quorum resource.
3. Use the Disk Administrator program to create, format, and assign drive letters to the disk partitions on the new logical drives.
4. On each of the remaining cluster nodes in the cluster configuration, use the hot_add utility to add the new logical drives to the cluster node.
5. In the first cluster node, use the Cluster Administrator program to create cluster physical disk resources, using the new disk partitions on the new logical drives.

   Note: If the new disk is not displayed in the available disk list when you go through the Cluster Administrator program, you might have to restart the server.
6. Bring the cluster resources online in the first cluster node.
7. Use the Cluster Administrator program to move the newly created cluster physical disk resources to other nodes in the cluster configuration.
8. Make sure that the resources come online in other nodes in the cluster configuration.

Deleting logical drives

Attention: To avoid damage to your registry information, you must use the Cluster Administrator and Disk Administrator programs to delete the cluster physical disk resources, delete operating system partitions, and unassign drive letters before you delete logical drives or reset the configuration in the Storage Manager software.

Before you delete logical drives with the Storage Manager software, complete the following steps:

1. Use the Cluster Administrator to delete the cluster physical disk resources that own the logical drives that will be deleted.
2. Use the Disk Administrator to delete any partitions and to unassign drive letters that are associated with the logical drives.
3. If possible, restart the cluster nodes to remove the configuration information.

Using the SMdevices utility

The SMutil software includes a utility, SMdevices, that you can use to view the storage subsystem logical drive that is associated with an operating-system device name. This utility is helpful when you want to create drive letters or partitions by using Disk Administrator.

Note: The SMdevices command does not function with the DS3300 storage subsystem.

When you are finished creating the logical drives on a storage subsystem, to use SMdevices, complete the following steps on the host that is attached to that storage subsystem:

1. At a command prompt, change to the *installation_directory*\util directory, where *installation_directory* is the directory in which you installed the SMutil utility.

   The default directory is c:\Program Files\IBM_DS3000\util.
2. Enter the following command:

   ```
   SMdevices
   ```

   The software displays device identification information. For example, you might see the following information:

   ```
   \\.\PHYSICALDRIVEx [Storage Subsystem finance, Logical Drive debit,
   LUN xx, WWN worldwide_name]
   ```

   where:

   - *x* is the disk number that is displayed in Disk Administrator
   - *finance* is the name of the storage subsystem
   - *debit* is the name of the logical drive
   - *xx* is the LUN that is associated with the logical drive
   - *worldwide_name* is the worldwide name of the logical drive

Using the SMrepassist utility

You can use the SMrepassist utility to flush cached data for a logical drive.

Important: The FlashCopy drive cannot be added or mapped to the same server that has the base logical drive of the FlashCopy logical drive in a Windows Server 2003 or NetWare environment. You must map the FlashCopy logical drive to another server.

To flush cached data in a logical drive, complete the following steps:

1. At a command prompt, change to the *installation_directory*\util directory, where *installation_directory* is the directory in which you installed the SMutil utility.

   The default directory is c:\Program Files\IBM_DS3000\util.
2. Enter the following command:

   ```
   smrepassist -f logical_drive_letter
   ```

   where *logical_drive_letter* is the operating-system drive letter that was assigned to the disk partition that was created on the logical drive.

Stopping and restarting the host-agent software

You must stop and restart the host-agent software if you add storage subsystems to the management domain of the host-agent software. When you restart the service, the host-agent software discovers the new storage subsystems and adds them to the management domain.

Note: If none of the access logical drives are detected after a restart, the host-agent software automatically stops running. Make sure that the Fibre Channel or iSCSI connection from the host to the SAN to which the DS3300 or DS3400 storage subsystem is attached is working correctly. Then, restart the host or cluster node so that new host-agent-managed storage subsystems can be discovered.

To stop and restart the host-agent software for Windows Server 2003, complete the following steps:

1. Click **Start → Administrative Tools → Services**. The Services window opens.
2. Right-click **IBM DS3000 Storage Manager 2 Agent**.
3. Click **Restart**. The IBM DS3000 Storage Manager 2 Agent stops and then starts again.
4. Close the Services window.

Uninstalling storage management software components

Use the following procedure to uninstall one or more of the components of the Storage Manager 2 software. Existing storage array mappings and storage partition configurations are retained during software removal and will be recognized by the new client software.

Important: Do not uninstall the MPIO device driver unless you are instructed to do so by your technical-support representative. The host-agent package requires MPIO to function correctly.

To uninstall the Storage Manager 2 software, complete the following steps:

1. Click **Start → Settings → Control Panel**. The Control Panel window opens.
2. Select **Add/Remove programs**. The Add/Remove Programs Properties window opens.
3. Select **IBM DS3000 Storage Manager Host Software 02*xx*.x5.*yy***, where *xx* is the main release (for example, 17) and *yy* is the version (for example, 01).
4. Click **Change/Remove**. The Uninstall program starts.
5. Click **Next**. The “Uninstall options” window opens.
6. Select to uninstall all installed DS3000 host-software packages or to uninstall specific packages only, and click **Next**. If you selected to uninstall all host-software packages, the program begins the uninstallation of all of the installed host-software packages.
7. If you selected to uninstall a specific host-software package, select the host-software packages that you want to uninstall, and click **Uninstall**.
8. Click **Done** to complete the DS3000 host-software uninstallation process. If you are uninstalling MPIO, you must restart the host server.

Chapter 10. Enabling and using premium features

Premium features provide enhanced functionality that enables you to perform tasks that might be limited or unavailable with your base storage subsystem model.

You can purchase the following premium features for a DS3000 storage subsystem:

- DS3000 FlashCopy Expansion License
- DS3000 Volume Copy License
- DS3000 FlashCopy Volume Copy License
- DS3000 Partition Expansion License

For information about how to purchase a premium feature, contact your IBM marketing representative or authorized reseller.

Obtaining the activation key file and enabling a premium feature

Follow the *Activation Instructions* document that comes with your premium feature to obtain the activation key file. The activation key file is required by the Storage Manager software to enable the premium feature.

Enabling the DS3000 Partition Expansion License

You can upgrade the DS3000 Partition Expansion License from 4 to 16 partitions for the storage subsystem. After you have obtained the DS3000 Partition Expansion License key, to enable this feature in the Storage Manager software, complete the following steps:

1. Open the Subsystem Management window and click **Tools → View/Enable Premium Features**.
2. Under **Enabled Premium Features**, click **Upgrade a feature**, as shown in Figure 36 on page 102.

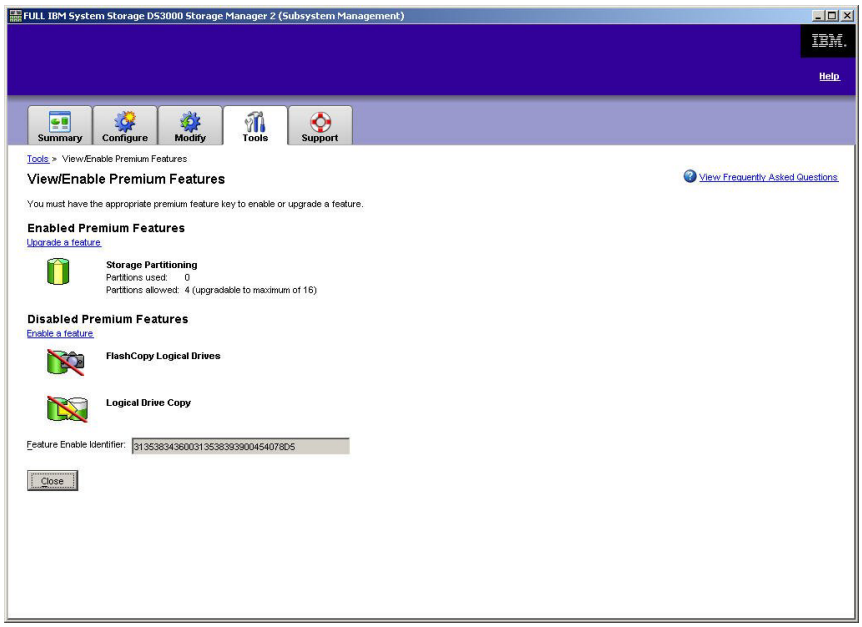

Figure 36. View/Enable Premium Features window

The Select Feature Key File window opens.

3. Select the feature key file that you obtained from the IBM Web site and click **OK**.
4. In the Enable Premium Feature window, click **Yes**.

Enabling the DS3000 FlashCopy Expansion License

After you have obtained the DS3000 FlashCopy Expansion License key, to enable this feature in the Storage Manager software, complete the following steps:

1. Open the Subsystem Management window and click **Tools → View/Enable Premium Features**.
2. Under **Disabled Premium Features**, click **Enable a feature**, as shown in Figure 36. The Select Feature Key File window opens.
3. Select the feature key file that you obtained from the IBM Web site and click **OK**.
4. In the Enable Premium Feature window, click **Yes**.

Enabling the DS3000 VolumeCopy License

Note: The terms *VolumeCopy* and *Logical Drive Copy* are used interchangeably throughout this document, the Storage Manager Client program interface, and the online help.

To enable the DS3000 Volume Copy License, complete the following steps:

1. Open the Subsystem Management window and click **Tools → View/Enable Premium Features**.
2. Under **Disabled Premium Features**, click **Enable a feature**, as shown in Figure 36. The Select Feature Key File window opens.
3. Select the feature key file that you obtained from the IBM Web site and click **OK**.

4. In the Enable Premium Feature window, click **Yes**.

Using the FlashCopy premium feature

A FlashCopy logical drive is a logical point-in-time image of a logical drive, called a base logical drive. A FlashCopy logical drive has the following features:

- It is created quickly and requires less disk space than an actual logical drive.
- It can be assigned a host address, so that you can perform backups by using the FlashCopy logical drive while the base logical drive is online and accessible.
- You can use the FlashCopy logical drive to perform application testing or both scenario development and analysis. This does not affect the actual production environment.
- The maximum number of FlashCopy logical drives that is allowed is one-half of the total logical drives that are supported by your controller model.

For more information about the FlashCopy feature and how to manage FlashCopy logical drives, see the Subsystem Management online help.

Important: The FlashCopy drive cannot be added or mapped to the same server that has the base logical drive of the FlashCopy logical drive in a Windows Server 2003 or NetWare environment. You must map the FlashCopy logical drive to another server.

To create a FlashCopy logical drive, complete the following steps:

1. To make sure that you have the accurate point-in-time image of the base logical drive, stop applications and flush cache I/O to the base logical drive.
2. Open the Subsystem Management window, click **Configure → Create FlashCopy Logical Drive**, and follow the instructions in the wizard.
3. For instructions for adding the FlashCopy logical drive to the host, see the Subsystem Management online help

Note: To manage created FlashCopy Logical Drives, click the **Modify** tab and select **Modify FlashCopy Logical Drives**. Select **Disable FlashCopy Logical Drives**, **Re-create FlashCopy Logical Drives**, or **Expand the FlashCopy Repository** and then follow the instructions in the wizard.

Using VolumeCopy

The VolumeCopy feature is a firmware-based mechanism for replicating logical drive data within a storage array. This feature is designed as a systems-management tool for tasks such as relocating data to other drives for hardware upgrades or performance management, data backup, or restoring snapshot volume data. You submit VolumeCopy requests by specifying two compatible drives. One drive is designated as the source and the other as the target. The VolumeCopy request is persistent so that any relevant result of the copy process can be communicated to you.

For more information about the VolumeCopy feature and how to manage VolumeCopy logical drives, see the Subsystem Management online help.

To create a VolumeCopy, open the Subsystem Management window, click **Configure → Create Volume Copy**, and follow the instructions in the wizard

Note: To manage created VolumeCopy logical drives, click **Modify → Manage Logical Drive Copies**. A list of VolumeCopy requests is displayed. For each

VolumeCopy, select **Re-Copy** or **Stop**, and to modify attributes, select **Permissions** and **Priority**. Figure 37 shows this tool.

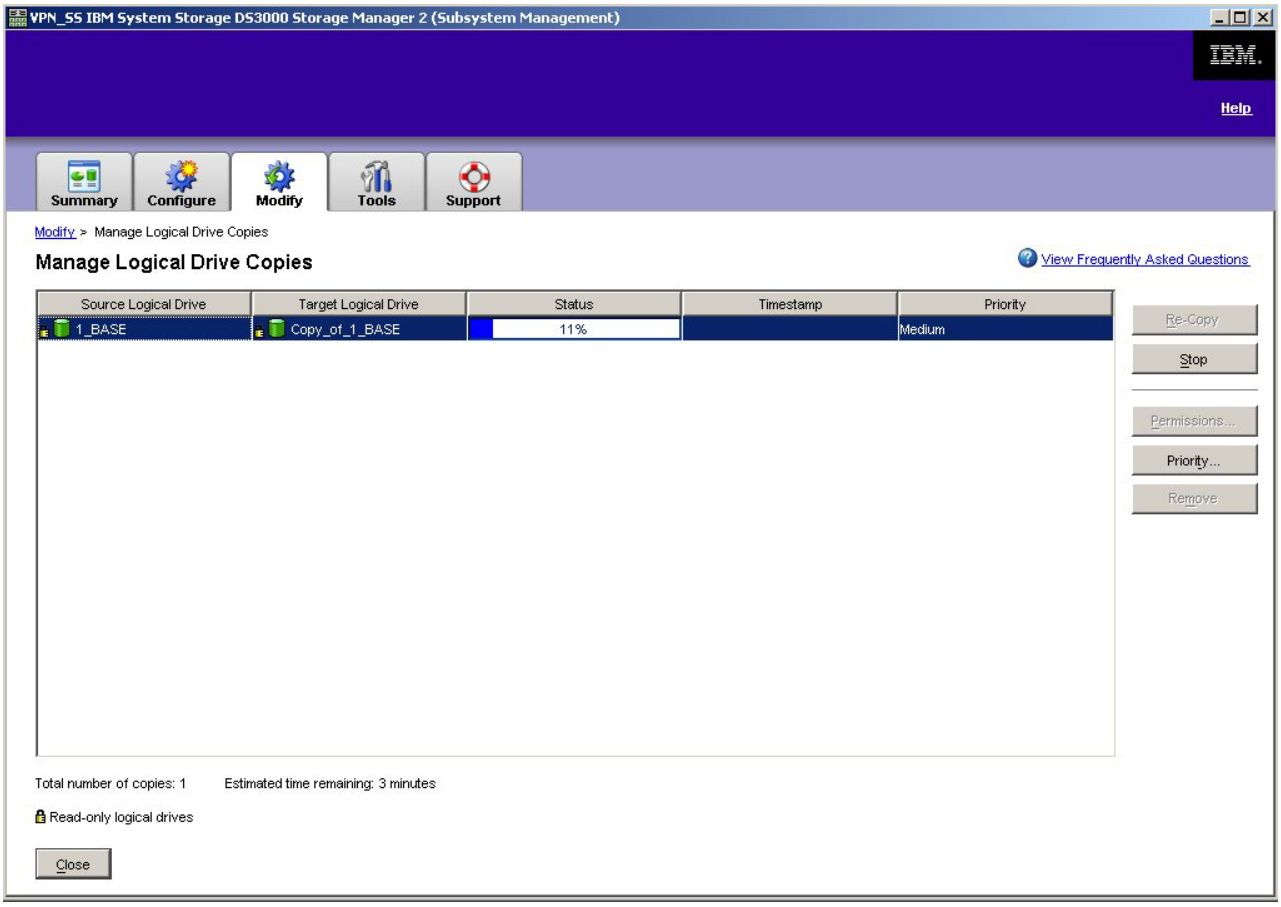

Figure 37. Manage Logical Drive Copies window

Appendix A. Storage subsystem and controller information record

Table 12 provides a data sheet for recording storage subsystem names, management types, Ethernet hardware addresses, and IP addresses. Make a copy of this table and complete the information for your storage subsystems and controllers. Use the information to set up the BOOTP table for the network server and the host or Domain Name System (DNS) table. The information is also helpful if you add storage subsystems after initial installation. Each column heading includes a page reference for detailed instructions for obtaining the information. For a sample information record, see Table 11 on page 25.

Table 12. Storage subsystem and controller information record

Storage subsystem name (page 24)	Management method (page 8)	Controllers: Ethernet and IP addresses, and host name (pages 24 and 25)		Host: IP address and host name (page 25)

Appendix B. Using the IBM System Storage DS3000 Controller Firmware Upgrade Tool

Important:
Use the IBM System Storage DS3000 Controller Firmware Upgrade Tool only when you are migrating DS3000 controllers from version 06.22 or 06.24 to version 07.35.

Do not use the controller firmware upgrade tool to perform standard upgrades for controller, ESM, or hard disk drive firmware. To perform a standard firmware upgrade for a DS3000 controller, EXP3000 ESM, or a hard disk drive, see “Downloading controller, NVSRAM, ESM, and hard disk drive firmware” on page 84.

Overview

Attention: To prevent the loss of date, before you use the controller firmware upgrade tool to migrate from firmware version 06.22 or 06.24 to version 07.35, you must backup all data and save the existing system configuration. After the upgrade tool has completed a firmware upgrade, the DS3000 controllers cannot be returned to previous firmware version levels.

Before you use the upgrade tool, read the following important information:

- Perform the upgrade offline.
- Perform the overall installation of the Storage Manager software into an existing host environment online.
- For most failover drivers to take effect, restart the host.
- Make sure that all devices have an Optimal status before you download firmware.
- Check the current firmware level to make sure that the firmware level is either 06.22.xx.xx or 06.24.xx.xx. The firmware upgrade tool supports upgrading to 07.xx level firmware from only firmware versions 06.22.xx.xx or 06.24.xx.xx.

Attention: To avoid a potential loss of data access, check the Storage Manager readme file to make sure that the firmware you download is compatible with the Storage Manager software that is installed on your storage subsystem. If non-compatible firmware is downloaded, you might lose access to the drives in the storage subsystem, so upgrade the Storage Manager software first. Do not make changes to your configuration or remove drives or enclosures during the upgrade process.

Checking the storage subsystem health conditions

To determine the health condition of the storage subsystem, complete the following steps:

1. From the Array Management window in the Storage Manager software, right-click the storage subsystem. The Storage Manager software establishes communication with each managed device and determines the current status. There are six possible status conditions:

   Optimal
   Every component in the storage subsystem is in the working condition that you want.

Needs Attention
A problem exists with the storage subsystem that requires intervention to correct it.

Fixing A Needs Attention condition is corrected, and the storage subsystem is currently changing to an Optimal status.

Unresponsive
The management station cannot communicate with one or both controllers in the storage subsystem.

Contacting Device
The Storage Manager software is establishing contact with the storage subsystem.

Needs Upgrade
The storage subsystem is running a level of firmware that is no longer supported by the Storage Manager software.

2. If the status is Needs Attention, write down the condition. Contact your IBM technical-support representative for fault resolution.

   Note: The Recovery Guru in the Storage Manager software also provides a detailed explanation of the conditions and recovery procedures.

Installing the controller firmware upgrade tool

To install the controller firmware upgrade tool, complete the following steps:

1. Open the DS3000 Storage Manager 10 installation file according to your operating system procedures. The IBM System Storage DS3000 Controller Firmware Upgrade Tool is installed as part of the Storage Manager 10 installation.
2. Click **Next**.
3. Accept the license agreement, and click **Next**.
4. Select the folder in which you want to install the tool, and click **Next**.
5. Click **Install**.
6. Click **Done**.

Adding a storage subsystem

To add a storage subsystem using the upgrade tool, complete the following steps:

1. Click **Add**. The Select Addition Method window opens.
2. Select either **Automatic** or **Manual**.
3. Click **OK** to begin adding storage subsystems.
4. To view any issues with the storage subsystem that you added that might impede upgrading the firmware, click **View Log**.

Downloading the firmware

To download the firmware, complete the following steps:

1. Select the storage subsystem for which you want to download the firmware, and then click **Download Firmware**. The Download Firmware window opens.
2. To choose the controller firmware file that you want to download from a directory on your computer or on your network, click **Browse**.

3. To choose the NVSRAM file that you want to download from a directory on your computer or on your network, click **Browse**.
4. Click **OK**. The firmware starts to download. A status bar is displayed in the Controller Firmware Upgrade window.

After the firmware file is downloaded, the firmware begins the activation process, and the status Activating is displayed in the status bar in the controller firmware upgrade tool.

Note: The firmware activation process can take up to 30 minutes to be completed. If after 30 minutes the Activating status message is not changed, check the controller profile data using the Storage Manager 10 software to determine if the firmware download has completed successfully.

Viewing the controller firmware upgrade tool log file

If you encounter any problems updating the controller firmware, complete the following steps to view the controller firmware upgrade tool log file:

1. Click **View Log**. The View Log window opens. This log documents any issues with the storage subsystem that might prevent you from updating the firmware.
2. If any issues are documented in the log, correct those issues before you try to download the firmware.

Appendix C. Accessibility

This section provides information about alternative keyboard navigation, which is an accessibility feature of the DS3000 Storage Manager software. Accessibility features help a user who has a physical disability, such as restricted mobility or limited vision, to use software products successfully.

By using the alternative keyboard operations that are described in this section, you can use keys or key combinations to perform Storage Manager tasks and initiate many menu actions that can also be done with a mouse.

In addition to the keyboard operations that are described in this section, the DS3000 Storage Manager 2 software installation package for Windows includes a screen reader software interface. To enable the screen reader, select **Custom Installation** when you use the installation wizard to install the Storage Manager 2 software on a Windows host or management station. Then, in the Select Product Features window, select **Java Access Bridge** in addition to the other required host software components.

Keyboard focus is not always clearly shown in the panes of the help viewer window. If you cannot see where the keyboard focus is, press Ctrl+F1. If the focus is on the Back, Forward, Print, or Page Setup button in the toolbar, the alternative text for the button is displayed. If alternative text is not displayed, keyboard focus is not on a button. Press Ctrl+Tab to see whether the focus is on one of the navigator tabs (**Contents** tab, **Index** tab, or **Search** tab). If the focus is on one of the navigation tabs, press Shift+Tab to change the focus to the toolbar pane.

Table 13 defines the keyboard operations that you can use to navigate, select, or activate user interface components. The following terms are used in the table:

- *Navigate* means to move the input focus from one user interface component to another.
- *Select* means to choose one or more components, typically for a subsequent action.
- *Activate* means to carry out the action of a component.

In general, navigation among components requires the following keys:

- **Tab:** Moves keyboard focus to the next component or to the first member of the next group of components
- **Shift+Tab:** Moves keyboard focus to the previous component or to the first component in the previous group of components
- **Arrow keys:** Move keyboard focus among the components in a group of components

Table 13. DS3000 Storage Manager software alternate keyboard operations

Shortcut	Action
F1	Open the Help.
F10	Move keyboard focus to the main menu bar and posts first menu; use the arrow keys to navigate through the available options.
Alt+F4	Close the management window.
Alt+F6	Move keyboard focus among windows (non-modal) and among management windows.

Table 13. DS3000 Storage Manager software alternate keyboard operations (continued)

Shortcut	Action
Alt+*underlined_letter*	Access menu items, buttons, and other interface components by using the keys that are associated with the underlined letters. For the menu options, press the Alt+*underlined_letter* to access a main menu, and then press the underlined letter to access the individual menu item. For other interface components, press Alt+*underlined_letter*.
Ctrl+F1	Display or conceal a tool tip when keyboard focus is on the toolbar.
Spacebar	Select an item or activate a hyperlink.
End, Page Down	Move keyboard focus to the last item in the list.
Esc	Close the current window (does not require keyboard focus).
Home, Page Up	Move keyboard focus to the first item in the list.
Shift+Tab	Move keyboard focus through components in the reverse direction.
Ctrl+Tab	Move keyboard focus from a table to the next user interface component.
Tab	Navigate keyboard focus among components or select a hyperlink.
Down Arrow	Move keyboard focus down one item in the list.
Left Arrow	Move keyboard focus to the left.
Right Arrow	Move keyboard focus to the right.
Up Arrow	Move keyboard focus up one item in the list.

Appendix D. Getting help and technical assistance

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. This section contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your system, and whom to call for service, if it is necessary.

Before you call

Before you call, make sure that you have taken these steps to try to solve the problem yourself:

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system and any optional devices are turned on.
- Use the troubleshooting information in your system documentation, and use the diagnostic tools that come with your system. Information about diagnostic tools is in the *Problem Determination and Service Guide* on the IBM *Documentation* CD that comes with your system.
- Go to the IBM support Web site at http://www.ibm.com/systems/support/ to check for technical information, hints, tips, and new device drivers or to submit a request for information.

You can solve many problems without outside assistance by following the troubleshooting procedures that IBM provides in the online help or in the documentation that is provided with your IBM product. The documentation that comes with IBM systems also describes the diagnostic tests that you can perform. Most systems, operating systems, and programs come with documentation that contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the documentation for the operating system or program.

Using the documentation

Information about your IBM system and preinstalled software, if any, or optional device is available in the documentation that comes with the product. That documentation can include printed documents, online documents, readme files, and help files. See the troubleshooting information in your system documentation for instructions for using the diagnostic programs. The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software. IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. To access these pages, go to http://www.ibm.com/systems/support/ and follow the instructions. Also, some documents are available through the IBM Publications Center at http://www.ibm.com/shop/publications/order/.

Getting help and information from the World Wide Web

On the World Wide Web, the IBM Web site has up-to-date information about IBM systems, optional devices, services, and support. The address for IBM System x™ and xSeries® information is http://www.ibm.com/systems/x/. The address for IBM BladeCenter® information is http://www.ibm.com/systems/bladecenter/. The address for IBM IntelliStation® information is http://www.ibm.com/intellistation/.

You can find service information for IBM systems and optional devices at http://www.ibm.com/systems/support/.

Software service and support

Through IBM Support Line, you can get telephone assistance, for a fee, with usage, configuration, and software problems with System x and xSeries servers, BladeCenter products, IntelliStation workstations, and appliances. For information about which products are supported by Support Line in your country or region, see http://www.ibm.com/services/sl/products/.

For more information about Support Line and other IBM services, see http://www.ibm.com/services/, or see http://www.ibm.com/planetwide/ for support telephone numbers. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

Hardware service and support

You can receive hardware service through your IBM reseller or IBM Services. To locate a reseller authorized by IBM to provide warranty service, go to http://www.ibm.com/partnerworld/ and click **Find a Business Partner** on the right side of the page. For IBM support telephone numbers, see http://www.ibm.com/planetwide/. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

In the U.S. and Canada, hardware service and support is available 24 hours a day, 7 days a week. In the U.K., these services are available Monday through Friday, from 9 a.m. to 6 p.m.

IBM Taiwan product service

台灣 IBM 產品服務聯絡方式：
台灣國際商業機器股份有限公司
台北市松仁路 7 號 3 樓
電話：0800-016-888

IBM Taiwan product service contact information:
IBM Taiwan Corporation
3F, No 7, Song Ren Rd.
Taipei, Taiwan
Telephone: 0800-016-888

Appendix E. Notices

This information was developed for products and services offered in the U.S.A.

IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

IBM Director of Licensing
IBM Corporation
North Castle Drive
Armonk, NY 10504-1785
U.S.A.

INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this IBM product, and use of those Web sites is at your own risk.

IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Trademarks

IBM, the IBM logo, and ibm.com are trademarks or registered trademarks of International Business Machines Corporation in the United States, other countries, or both. If these and other IBM trademarked terms are marked on their first occurrence in this information with a trademark symbol (® or ™), these symbols indicate U.S. registered or common law trademarks owned by IBM at the time this information was published. Such trademarks may also be registered or common law trademarks in other countries. A current list of IBM trademarks is available on the Web at "Copyright and trademark information" at http://www.ibm.com/legal/copytrade.shtml.

Adobe and PostScript are either registered trademarks or trademarks of Adobe Systems Incorporated in the United States and/or other countries.

Cell Broadband Engine is a trademark of Sony Computer Entertainment, Inc., in the United States, other countries, or both and is used under license therefrom.

Intel, Intel Xeon, Itanium, and Pentium are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.

Java and all Java-based trademarks are trademarks of Sun Microsystems, Inc., in the United States, other countries, or both.

Linux is a registered trademark of Linus Torvalds in the United States, other countries, or both.

Microsoft, Windows, and Windows NT are trademarks of Microsoft Corporation in the United States, other countries, or both.

UNIX is a registered trademark of The Open Group in the United States and other countries.

Other company, product, or service names may be trademarks or service marks of others.

Important notes

When referring to hard disk drive capacity or communications volume, MB stands for 1 000 000 bytes, and GB stands for 1 000 000 000 bytes. Total user-accessible capacity can vary depending on operating environments.

Maximum internal hard disk drive capacities assume the replacement of any standard hard disk drives and population of all hard disk drive bays with the largest currently supported drives that are available from IBM.

IBM makes no representation or warranties regarding non-IBM products and services that are ServerProven, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. These products are offered and warranted solely by third parties.

IBM makes no representations or warranties with respect to non-IBM products. Support (if any) for the non-IBM products is provided by the third party, not IBM.

Some software might differ from its retail version (if available) and might not include user manuals or all program functionality.

Index

G

H

I

K

L

M

N

O

P

R

S

T

U

V

W

Z

Part Number: 46M1364

Printed in USA

(1P) P/N: 46M1364